

KODIAK MANAGEMENT AREA
SALMON RESEARCH OPERATIONAL PLANS FOR 1992

Regional Information Report 4K92-25

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

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OPERATIONAL PLAN

1992

KODIAK MANAGEMENT AREA

CATCH SAMPLING

**Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615**

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INTRODUCTION

The Kodiak Management Area extends from Imuya Bay on the south to Cape Douglas on the north and includes Shelikof Strait and the waters of Kodiak, Afognak, and Shuyak Islands (Figure 1). The area includes 454 specified salmon streams and lakes. The management area is divided into nine districts and 98 statistical areas. The districts and statistical areas are established to facilitate specific stock management.

Five Pacific salmon species are harvested in the Kodiak Management Area. Sockeye salmon are economically the most important species followed by pink, chum, coho, and chinook salmon. The 1991 catch was 5,704,000 sockeye, 16,643,000 pink, 1,029,000 chum, 325,000 coho, and 22,000 chinook salmon. The total harvest was 23,723,000 fish. The 1992 harvest is projected to be 3,247,000 sockeye, 250,000 coho, 9,200,000 pink, 870,000 chum and 10,000 chinook salmon.

The Alaska Department of Fish and Game assumed the responsibility of managing Alaska's salmon resources in 1960. The goal has been to manage the resource for maximum sustained yield. Generally, achievement of this goal is accomplished by: 1) setting and implementing escapement objectives by system which will produce the greatest number of harvestable fish and; 2) deriving techniques necessary to assist fishery managers in obtaining escapement goals and optimum harvest. Assignment of catch to river system of origin is a prerequisite for evaluating escapement objectives and forecasting stock returns. In 1985 an expanded salmon commercial catch sampling operation was initiated in the Kodiak Management Area for establishing a data

base for determining stock contribution levels, evaluating escapement goals, and forecasting. The program has continued since. The current emphasis is on sockeye and chum salmon.

OBJECTIVES

Long Term

Improved management of the salmon resources for the Kodiak Management Area through enhanced precision of forecasting, development of stock-recruitment relationships for assessing escapement requirements, and accurate determination of stock composition estimates for mixed stock fisheries.

Short Term

- 1) Collect representative age composition data of the sockeye and chum salmon catches from selected fisheries.
- 2) Collect representative sockeye scales from selected fisheries, including the North Shelikof Strait fishery, for stock separation studies.

SUPERVISION

Pat Holmes will supervise the catch sampling at the Port of Kodiak, while biologist Charlie Swanton will supervise the Alitak catch sampling and the Alitak Bay June test fishery.

PERSONNEL

Personnel assignments at Alitak and the Port of Kodiak are defined in Table 1. Available permanent and seasonal staff will assist in catch sampling at the Port of Kodiak.

PROCEDURES

Catch Sampling

The sockeye and chum salmon catches will be sampled for age, length, and sex (ALS) by the crew at the Port of Kodiak and at Alitak according to the schedules in Tables 2 and 3.

All catch sampling data are to be representative and random. To ensure that this occurs mixed loads from non-targeted areas are not to be sampled, and there is to be no pre-selection of fish for length, sex, condition, or any other factor.

To ensure that sockeye and chum samples are not missed the crews will begin sampling the first day the respective species catches are delivered from the designated sampling areas each week (Tables 2 and 3).

The standard procedures for collecting and recording salmon ALS data are defined in Appendix A and B. The accuracy of the data will be the responsibility of the crew leaders. If questions or problems arise, do not hesitate to inquire with your supervisor for clarification or assistance.

Table 1. Salmon catch sampling crew for Kodiak Management Area, 1992.

Location	Name	Title	PCN	Position	Period
Port of Kodiak	Patrick Holmes	FB II	1273	Crew Leader	June 9 - Aug 31
Alitak	Leslie Scott	FB I	1413	Crew Leader	June 9 - July 15
	Bruce McIntosh	FT III	1594	Crew	June 7 - July 15
	Kim Phillips	FT III	1825	Crew	May 26 - July 7
	Bruce McIntosh	FT III	1594	Crew Leader	July 16 - Aug 31

Table 2. Sockeye salmon catch sampling schedule for the Kodiak Management Area, 1992.

Crew	SAMPLING AREA			Season	SAMPLE			Fishery
	District/Section	Geographic Area	Statistical Area		Freq.	Size ^a	Data	
Port of Kodiak	N. W. Kodiak/Central Afognak District, ^b	Uganik/Viekoda Bays	253	June 9-Aug 31	Weekly	600	Scales	Mixed-stock
	Shuyak Is. Section & NW Afognak Section	Point Banks to	251-30 thru 70	July 6-25	Weekly ^c	600 ^d	Scales	Mixed-stock
	SW Afognak Section	Raspberry Cape	251-10,20	July 6-25	Weekly ^c	600	Scales	Mixed-stock
	Mainland District ^b							
	Dakavak Section	Dakavak Bay	262-10 through 55	July 6-25	Weekly ^c	600	Scales	Mixed-stock
	Outer Kukak Bay Section	to Cape Douglas						
	Hallo Bay Section							
	Big River Section							
	N.W. Kodiak	Uyak Bay ^e	254-10,20	June 9- Sept 16	Weekly	600	Scales	Mixed-stock
<hr/>								
Alitak	Mainland/Cape Igvak	Imuya Bay to Cape Aklek	262-70,80,90,95	June 9-July 25	Weekly	480	ALS	Mixed-stock
	Alitak Bay/Cape Alitak	Cape Alitak	257-10,20	June 9-Aug 31	Weekly	600	Scales	Mixed-stock
	Alitak Bay/Moser Bay	Moser/Olga Bay	257-40,41	June 9- July 15	Weekly	600	Scales	Mixed-stock
		Moser/Olga Bay	257-40,41	July 15-Aug 31	Weekly	600	Scales	Terminal
	S.W. Kodiak/ Inner, Outer Ayakulik	Red River	256-10,20	June 9-Aug 31	Weekly	600	Scales	Terminal

^a If the required 600-fish sample is impossible to obtain, reduce sample size to 480 fish.

^b The goal is to obtain a 600-fish weekly sample from: (1) NW Afognak and Shuyak Island Sections combined; (2) the SW Afognak Section; and (3) the Dakavak Bay to Cape Douglas reach of the Mainland District. When no pure samples are available from these areas, a combined Mainland and Afognak Districts 1,200-fish sample should be taken.

^c Sample each opening if there is more then one opening per week.

^d Exclude fish caught terminally at Thorshiem from the mixed stock sample. However, estimate the number of fish caught terminally for each opening; if possible obtain a pure terminal sample (600 fish-ALS) aside from the regular mix-stock fishery samples.

^e To be sampled at Larsen Bay and/or Port Bailey.

Table 3. Chum salmon catch sampling schedule for the Kodiak Management Area, 1991.

Crew	SAMPLING AREA		Season ^b	SAMPLE ^a		
	Geographic Area	Statistical Area		FREQ. ^b	SIZE	DATA
Port of Kodiak	Kiliuda Bay	258-20	Aug 1-Aug 21	Weekly	440	Scales
	Zachar Bay ^C	254-30	July 1-July 31	Weekly	440	Scales
Alitak	Sulua/Portage	257-60	Aug 1-Aug 21	Weekly	440	Scales
	Kukak Bay ^C	262-25, 27	Aug 1-Aug 31	Weekly	440	Scales

^a Crews will collect scales only, no lengths or sexes.

^b Samples will be collected only on the weeks when the fishery is terminal and directed specifically for chum salmon.

^c The M/V Coho may be able to collect the samples on the fishing grounds.

Periodically inseason the Alitak crew will send their completed (original) opscan forms and scale impression acetates to the Kodiak office for final processing. Correspondence should be directed to Patty Roche. The crew leader will notify the Kodiak office by radio that the data are being sent, and will maintain a log book of all out-going samples. The original scale cards and copies of the opscan forms should be hand carried to town at the end of the season. All scales collected by the Alitak crew will be pressed and aged at Lazy Bay prior to being mailed to Kodiak. An updated copy of the sampling log (Figure 2) should be sent weekly to the Kodiak office.

Each crew leader should review the Kodiak Management Plan contained in Appendix C.

At the end of the season the Alitak crew leader will inventory all gear at the camp and send to Kodiak that gear which needs repair. The State rifle is the only equipment that must be returned to Kodiak. All other equipment can be locked up on-site.

9

[illegible]

APPENDIX A
Scale Sampling Techniques

KODIAK SCALE SAMPLING TECHNIQUE

The following is an explanation of how salmon scale samples are taken. If you have not taken scales before or if you have any questions ask the Kodiak Management Biologist, Pat Holmes, to demonstrate the sampling procedure. Scales must be readable to be useful, so follow proper techniques when sampling.

Important Points to Remember

Gum Cards

A scale card is a gum-backed sheet numbered 1 through 40. Samples are placed on the cards with no attempt to separate the fish by their sex.

It is important to keep the gum card dry at all times. If weather does not allow you to do this it is best to suspend sampling until dryer conditions prevail. A wet gum card is useless as the scales will shift and come off and prevent a readable impression from being taken.

A new scale card is started for each day. Even if a card is not filled a new card is still to be started for each day. Also, a different card is to be used for each location, i.e. Red River vs. Cape Alitak. It is important that scale cards and numbers match the corresponding AWL sheet.

Scales

1. Clean the scale by wetting it and rubbing it between your fingers. Make sure no dirt, slime or skin (no silver color) remain on the scale.
2. Mount the scale on the gum card with the ridged side up. The ridged side is the same side that is exposed on the salmon.
3. One scale will be taken from sockeye and chum. Two scales will be taken for coho, and three scales for king salmon.
4. Take the preferred scale if it is available, if not available take a scale but note it is not preferred.
5. Scales should be neat, clean, and orderly.

Age-Weight-Length (AWL) Sampling Form

Age - Scale samples are taken for age.

Weight - Taken to nearest tenth of a kilogram on any adult fish not being returned live to the water.

Length - Taken with the fish laying flat from the mid-eye point to the fork of the tail. Measure to the nearest millimeter.

** Fill in all information on the AWL form.

** Each AWL form should match up with the appropriate scale card.

APPENDIX B

Completion of mark sense A.W.L. forms

Length, Sex, and Scale Sampling Procedure for Sampling:
Using Mark-Sense Forms
(Recommended by Statewide Stock Biology Group, May 1985)

INTRODUCTION

Salmon from the catch are sampled for length, sex, and scales annually by field crews throughout the state. This data base is essential to sound management of the State's salmon resources. This information is drawn upon by management and research biologists for: (1) forecasting run strengths; (2) setting escapement goals; (3) examining the productivity of each system; (4) salmon growth analysis; (5) catch apportionment (based on age composition and/or scale pattern analysis); (6) in-season run estimation; and (7) to gain a better understanding of the biology of each stock.

For clarification purposes a SCALE SAMPLE and SUB-SAMPLE will be defined as follows:

SCALE SAMPLE: A data set collected from a specific sampling location, containing scales and data from a single species, collected during a single year. All data forms and scale cards of a single SAMPLE have the same statistical code. AWL and scale card number in a sample are consecutively and chronologically ordered.

SUB-SAMPLE: Any portion of a scale sample consisting of consecutively numbered AWL's and scale cards. SUB-SAMPLES usually consist of one or more time segments of a sample.

To be useful, data must be recorded on the mark-sense forms neatly and accurately. The following procedures are to be adhered to when sampling for length, sex, and scales using mark-sense AWL forms.

COMPLETING THE FORMS:

A completed mark-sense AWL form and accompanying gum card for sampling commercial catches of sockeye and chum salmon are shown in Appendix B.1. A completed AWL form and accompanying gum cards for sampling commercial catches of chinook and coho salmon are shown in Appendix B.2.

Complete each section of the left side of the mark-sense form using a soft No. 2 pencil and darken the corresponding blocks as shown in the figures. Make every effort to darken the entire block as partially filled blocks are often missed by the optical scanner which reads and records the data from the mark-sense AWL forms. Label only one form at a time to avoid "the carbon paper effect" and resulting stray marks.

Description:

For escapement sampling: Species/Area/Catch or Escapement/gear type i.e. weir/Samplers (name and W-R-P)

Species: SOCKEYE Card No: 001
 Locality: AKALURA ESC.
 Stat. Code: 257-30-302
 Sampling Date: Mo 08 Day 16 Year 91
 Gear: BEACH SEINE
 Collector(s): HICKS KAPLAN PEARSON
 Remarks: _____

18	9	8	7	6	5	4	3	2
20	19	18	17	16	15	14	13	12
30	29	28	27	26	25	24	23	22
40	39	38	37	36	35	34	33	32

Samplers = HICKS, KAPLAN, PEARSON(R)

DESCRIPTION: SOCKEYE/AKALURA/ESC.

ADFG ADULT SALMON AGE-LENGTH
FORM VERSION 2.1

CARD: 001

SPECIES: 2

DAY: 16

MONTH: 08

YEAR: 91

DISTRICT: 257

SUBDISTRICT: 30

STREAM: 302

LOCATION: AKALURA

PERIOD: _____

PROJECT: 3

GEAR: 2

MESH: _____

TYPE OF LENGTH MEASUREMENT: 2

NUMBER SCALES/FISH: 1

OF CARDS: 1

SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
1					
2					
3					
4					
5					
6					
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DO NOT WRITE IN THIS MARGIN

litho code

229518

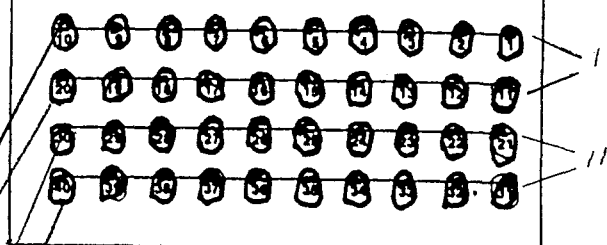
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NCS DUCSCAN® M820 17877-16 A4206

- | SPECIES | PROJECT | GEAR TYPE |
|--------------------|---|--------------------------|
| 1 - Chinook (king) | 1 - Commercial catch | 8 - Trap |
| 2 - Sockeye (red) | 2 - Subsistence catch | 9 - Purse seine |
| 3 - Coho (silver) | 3 - Escapement (tower, weir, ooner site, etc) | 10 - Beach seine |
| 4 - Pink (humpy) | 4 - Escapement - spawning grounds | 11 - Handpicked |
| 5 - Chum (dog) | 5 - Test fishing | 12 - Dip net |
| | 6 - Sport catch (marine) | 13 - Set gillnet |
| | 7 - Sport catch (freshwater) | 14 - Troll |
| | | 15 - Long line |
| | | 16 - Otter trawl |
| | | 17 - Fishwheel |
| | | 18 - Pots |
| | | 19 - Sport hook and line |
| | | 20 - Herring purse seine |
| | | 21 - Handpicked |
| | | 22 - Dip net |
| | | 23 - Set gillnet |
| | | 24 - Troll |
| | | 25 - Long line |
| | | 26 - Otter trawl |
| | | 27 - Fishwheel |
| | | 28 - 99 Unassigned |

Species: COHO Card No: 001A
 Locality: KARLUK ESC
 Stat. Code: 255-10-101-
 Sampling Date: Mo 08 Day 29 Year 91
 Gear: WEIR / TRAP
 Collector(s): T. STACK, S. BROWN, J. FOX
 Remarks: 2 SCALES / FISH

card: 001A



DESCRIPTION: COHO / KARLUK / ESC
2 SCALES / FISH

SAMPLERS:
T. STACK - W
S. BROWN - P
J. FOX - R

ADF&G ADULT SALMON AGE-LENGTH FORM VERSION 2.1

CARD: 001A#B

SPECIES: COHO

DAY: 29

MONTH: 08

YEAR: 91

DISTRICT: 255

SUBDISTRICT: 10

STREAM: 101

LOCATION: 35

PERIOD: -

PROJECT: ESC

GEAR: WEIR / TRAP

MESH: -

TYPE OF LENGTH MEASUREMENT: 2

NUMBER SCALES / FISH: 2

OF CARDS: 1

SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
1					
2					
3					
4					
5					
6					
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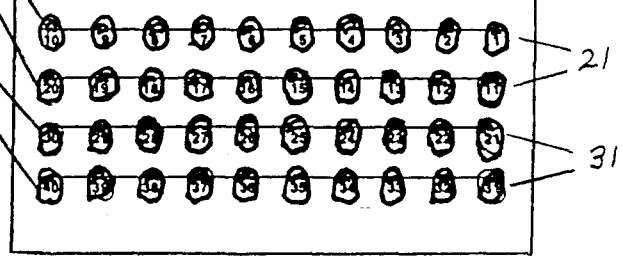
DO NOT WRITE IN THIS MARGIN

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litho code

Species: COHO Card No: 001B
 Locality: KARLUK ESC
 Stat. Code: 255-10-101-
 Sampling Date: Mo 08 Day 29 Year 91
 Gear: WEIR / TRAP
 Collector(s): T. STACK, S. BROWN, J. FOX
 Remarks: 2 SCALES / FISH

card: 001B



Appendix B.2. AWL and scale cards for sampling 2 scales per fish.

Card:

The AWL forms and corresponding gum card(s) are numbered sequentially by date throughout the season starting with 001. A separate numbering sequence will be used for each species, gear type, district, and geographic location. Consult your port supervisor for the current card number. Sockeye and chum samples will have only 1 card per AWL form as shown in Appendix B.1. Coho and chinook samples will contain up to four cards per AWL form as shown in Appendix B.2.

Species:

Refer to the reverse side of the AWL form for the correct digit.

Day, Month, Year:

Use appropriate digits for the date the fish are caught.

District:

List only one district. Consult project leader for appropriate district, subdistrict, and stream numbers.

Subdistrict:

List a single subdistrict if it is known and all the fish sampled were from that single subdistrict. Leave blank if more than one subdistrict is involved or if the subdistrict is unknown.

Stream:

Leave blank for catch sampling; for escapement sampling consult project leader for appropriate number.

Location:

List the appropriate code as shown on Appendix B.3.

Period:

Leave Blank - Do not fill in

Project:

Refer to the reverse side of the AWL form for the correct code.

Gear:

Refer to the reverse side of the AWL form.

Mesh:

Leave blank unless specifically instructed by supervisor to do otherwise.

Type of length measurement:

Use (2) mid-eye to fork-of-tail (unless specifically instructed to do otherwise). Refer to Appendix B.4.

of cards:

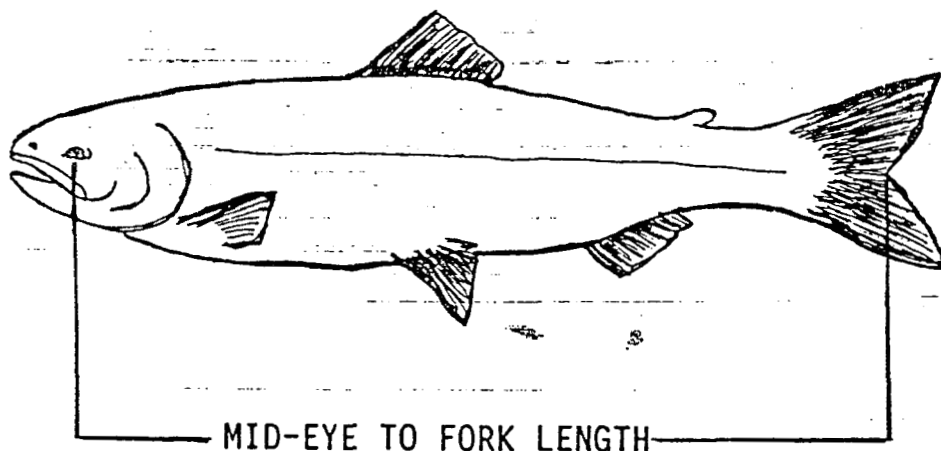
Mark 1 when sampling sockeye, chum, coho, and chinook salmon (Appendix B.1). When

Appendix B.3. Assigned port and weir location codes. (Use under location in filling out AWL's for catch and escapement sampling.)

Port Codes

001 - Pelican
002 - Elfin Cove
003 - Sitka
004 - Juneau
005 - Petersburg
006 - Ketchikan
007 - Craig
008 - Port Alexander
009 - Metlakatla
010 - Excursion Inlet
011 - Hoonah
012 - Wrangell
013 - Out of State
014 - Kake
015 - Gedney
016 - Security Bay
017 - Meyers
018 - Pt. Baker
019 - Klawock
020 - Yakutat
030 - Lazy Bay
031 - Port of Kodiak
032 - Pauls Lake
033 - Thorshiem
034 - Afognak River
035 - Karluk River
036 - Red River
037 - Upper Station
038 - Frazer Lake
039 - Dog Salmon
040 - Akalura River
041 - Uganik River
150 - King Cove
151 - Port Moller
052 - Dutch Harbor
053 - Akutan
054 - Sand Point
055 - Bear River, ADF&G Camp
056 - Nelson River, ADF&G Camp
057 - Canoe Bay

Appendix B.4 Measuring fish length, mid-eye to fork of tail.



Mid-eye to fork lengths are taken because the length and shape of a salmon's snout changes as it approaches sexual maturity. The procedure for measuring by this method follows:

- 1) Place the salmon flat on its right side, with its head to your left and the dorsal fin away from you.
- 2) The eye should be on the line projecting from the end of the meter stick. Hold the head in place with your right hand. Sometimes you can control the fish better by placing your thumb in the fish's mouth.
- 3) Flatten and spread the tail against the board with your right hand.
- 4) Read the mid-eye to fork length to the nearest millimeter.

sampling chinook and coho salmon write the card numbers (i.e. 001A, 001B, 003B, etc.) perpendicular to the left of the fish # column as shown in Appendix B.2.

It is paramount to keep the mark-sense forms flat, dry, and clean. Fish gurry and water curling will cause data to be misinterpreted by the optical scanning machine. In general, keep the forms neat enough and legible enough to have a stranger be able to make sense out of them.

Additional data columns are available on the reverse of the AWL for individual project use. If you as a project leader use them and wish that data to be read by the opscan reader, you will need to transfer the litho code from the front of the form to the reverse.

GUM CARD(S):

Fill out the gum cards as shown in Appendices B.1 and B.2.

Species:

Write out completely (i.e., chinook, sockeye, etc.).

Locality:

For catch sampling and escapement sampling write down area in which fish were caught followed by the word catch or escapement (i.e. Karluk River escapement).

Stat. code and Sampling date:

Transfer the appropriate digits from the AWL form.

Gear:

Write out completely.

Collector(s):

Record the last name or initials of the person(s) sampling.

Remarks:

Record any pertinent information such as number of scales per fish sampled, vessel/tender name, etc. Transfer this same information to the top margin of the AWL.

SAMPLING:

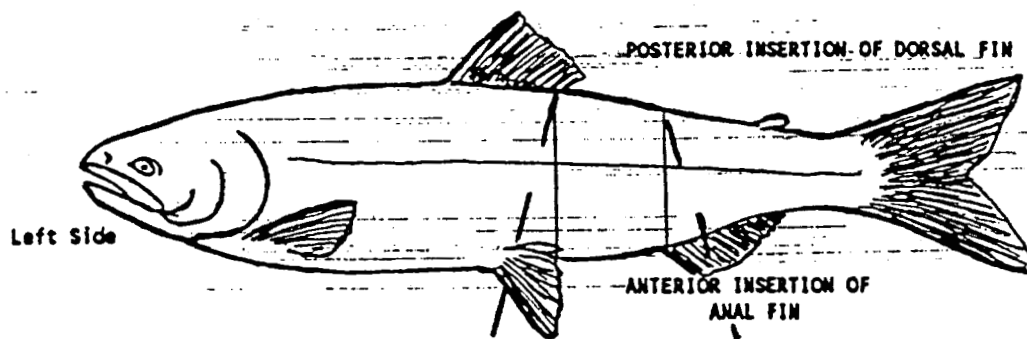
A. GENERAL

1. Sex the fish and darken M or F in the sex columns. If any difficulty was encountered in this procedure, write "I had trouble sexing these fish" on the top margin of the AWL and ask your supervisor for help as soon as possible before sexing additional fish.
2. Measure all species' length in millimeters from the middle of the eye to the fork of the tail, refer to Appendix B.4. Record length by blackening the appropriate column blocks on the AWL form. Column 3 on the AWL form is used for fish over 999 millimeters

long (Big Daddy Chinook). Measure all species of salmon to the nearest mm. Check the calipers daily, before use, to ensure the accuracy of the measurements.

3. Pluck the "preferred scale" from the fish using forceps. Remove all slime, grit, and skin from the scale by moistening and rubbing between fingers. The "preferred scale" is located on the left side of the fish, two rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin, refer to Appendix B.5. If the "preferred scale" is missing, select a scale within the preferred area on either the left or right side of the fish. If no scales are present in the "preferred area" on both sides of the fish, sample a scale as close to the preferred area as possible and darken the 8 under "age error code" on the AWL form.
4. Clean, moisten and mount scale on gum card directly over number 1 as shown in Appendix B.5. The side of the scale facing up on the gum card is the same as the side facing up when it was adhered to the fish. This outward facing side is referred to as the "sculptured" side of the scale. The ridges on this sculpture side can be felt with a fingernail or forceps. Mount scale with anterior end oriented toward top of gum card.
5. When sampling sockeye and chum salmon repeat steps 1 through 4 for up to 40 fish on each AWL form.
6. When taking multiple scales per fish as with chinook and coho salmon sample the "preferred scale" and scale #2 as shown in Appendix B.5. Scale #2 is one inch to the left of the "preferred scale," and is 2 rows above the lateral line. Mount the 2 scales from fish #1 over 1 and 11 on the gum card as shown in Appendix B.2. Continuing, mount the 2 scales from fish #2 over 2 and 12, etc. If sampling 3 scales, mount the scales over #1, #11, #21, etc.
7. Use plastic scale card holders to hold individual scale cards during sampling and cover the completed gum card with wax paper for storage.
8. When sampling a weired system you may use write in rain books to record the data. Keep the mark-sense forms in camp where they will be clean, dry, and flat. After sampling is done for the day transfer the data to the mark-sense forms. It is the responsibility of the data collector to transcribe the data before turning it over to the ARB.
9. Miscellaneous:
 - a. When scales are sampled in wet conditions it is difficult to mount scales in a fashion so as to result in a good scale impression being made. Glue often obscures scale features and scales frequently adhere poorly to the card. In this situation the scales should be remounted.
 - b. For adipose clipped fish record the head tag number on the corresponding row in the first five columns on the reverse side of the AWL.

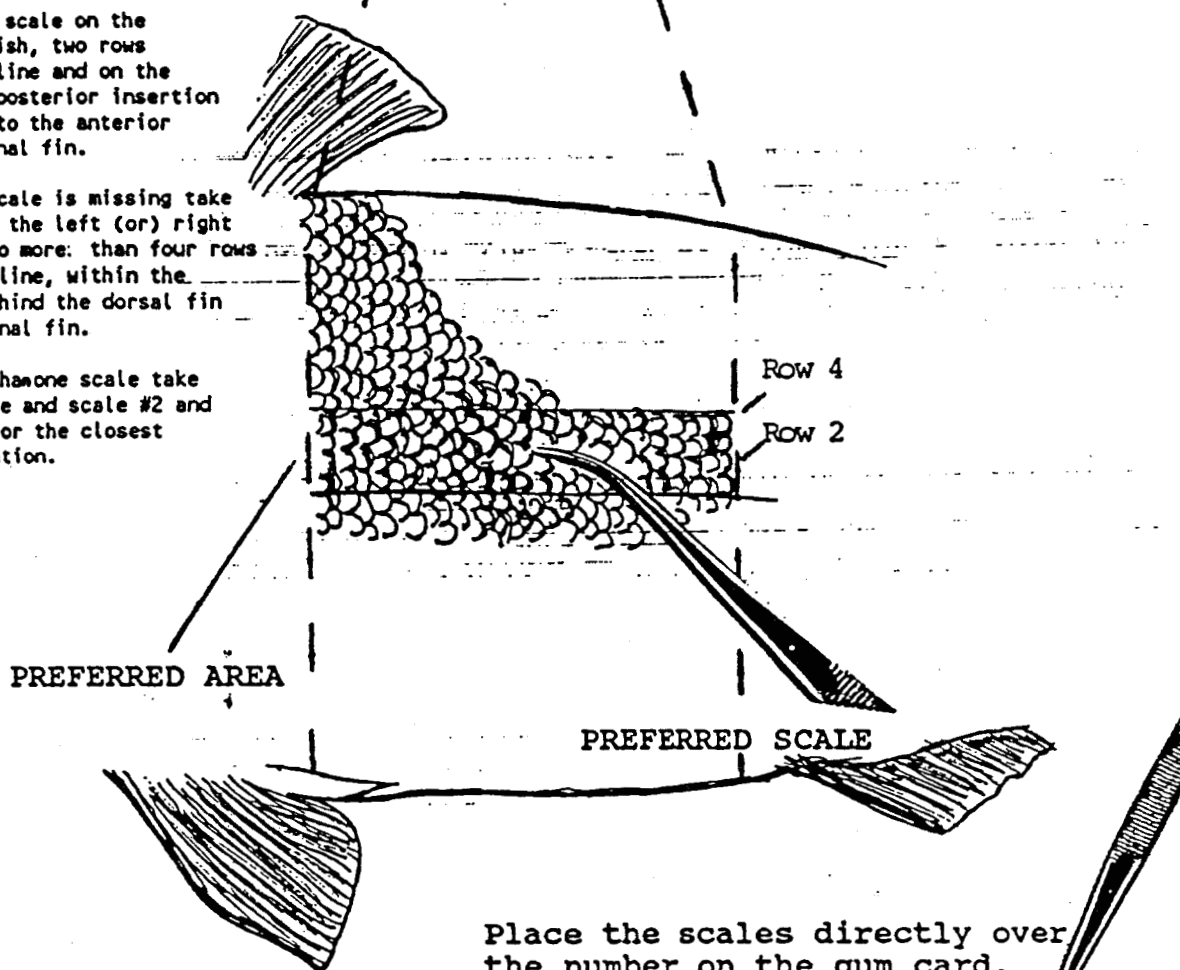
Appendix B.5. Sampling procedure for the preferred scale.



Take the preferred scale on the left side of the fish, two rows above the lateral line and on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin.

If the preferred scale is missing take a scale again from the left (or) right side of the fish no more than four rows above the lateral line, within the preferred area, behind the dorsal fin and ahead of the anal fin.

If sampling more than one scale take the preferred scale and scale #2 and scale #3 as shown or the closest scale to that location.



Note: Mount scales with the anterior portion (arches) of the scale pointed toward the top of the card.



Place the scales directly over the number on the gum card.

10	9	8	7	6	5	4	3	2	1
20	19	18	17	16	15	14	13	12	11
30	29	28	27	26	25	24	23	22	21
40	39	38	37	36	35	34	33	32	31

- c. Look down the form from two angles after the data has been recorded to pick up any glaring mistakes. A common error occurs, for instance, in placing both the 4 and 7 of a 475 mm fish in the 100's column with nothing in the 10's column.
 - d. Keep all fish gurry off forms and erase any stray marks on the forms before turning them in to your supervisor.
 - e. Write in all comments explicitly and completely under remarks, transfer remarks to top margin of AWL.
 - f. Responsibility for accuracy lies first with the primary data collector(s). The port supervisor will return sloppy or incomplete data to individual collectors. After editing a form, place your initials next to card #, but not in left margin.
10. As soon as possible after completion send the samples and mark-sense forms to the ARB in Kodiak. During scheduled radio calls before and following the sending of data to the ARB, the crew leader will notify the ARB: 1) that the data is being mailed (use a moisture-proof container); 2) what data is being sent; 3) when delivery is expected in Kodiak; and 4) who is transporting the data. It is important that these steps are followed to ensure delivery.

B. SAMPLING SCENARIOS:

1. Differing size crews:

- a. One person: Wrestle the fish into the measuring board, wearing a glove on one hand. Measure the fish and write the sex and length down on the measuring board to be transferred to the AWL after ten fish have been measured. Next, pluck the preferred scale(s), clean, and mount on the gum card which is taped to the AWL in the clipboard which is sitting on the end of the measuring board. After ten fish have been processed, remove the glove and record the sexes and lengths on the AWL with your clean hand. A slime rag may be helpful.
- b. Two persons:
 - (1) When sampling more than one scale per fish, one person can wrestle the fish and record data while the other plucks and mounts scales. The wrestler needs to wear a glove that he can slip off his writing hand to record the sex and length data on the AWL form.
 - (2) When sampling one scale per fish, the person plucking the scales also records the data.
- c. Three persons: One person wrestles the fish, one plucks and mounts the scales, and the third records the data.

2. Sampling tote to tote:

- a. When sampling for 2 or 3 scales per fish (chinook and coho) use two persons.
- b. When sampling for 1 scale per fish (sockeye and chum) use three persons, if available.

SCALE SAMPLING CHECKLIST

Clipboard	Pencils (No.2)	Gloves
Gum Cards	Forceps	Measuring board or calipers
AWL's	Wax paper inserts	Sampling Manual
		Plastic scale card holders

Some Reminders

1. For greater efficiency in scale reading and digitizing, mount scales with anterior end toward top of scale card.
2. AWLs should be carefully edited. Re-check header information on AWLs; make sure all available information is filled in. Take extra care to use the correct statistical week for the sampling or catch date. Page numbers should not be repeated; a frequent error is to begin a week's sample with the last page number used the week before. This is particularly important if the data is regularly sent to town; it is easy to forget which numbers were used. Crew leaders should take time to ensure that the boxes are being blackened correctly, if the boxes are sloppily marked the optical scanner records the information incorrectly or misses it entirely. Keep marks within each rectangle and completely fill them. After AWLs are edited, place editor's initial next to page number, but not in left margin.
3. Check to make sure error codes are being used correctly, i.e. error code 7 is wrong species, error code 8 is non-preferred. Error code 6 is for the use of the scale reader, it refers to the reabsorption of the scale.
4. Transfer important comments from scale cards to AWLs. After pressing scales, the cards are seldom referred to again, and important remarks can be lost. Write comments in the top margin (not on the left side) or on the reverse of the AWL. If there is not room on the AWL to completely explain the remarks, use a separate piece of paper.
5. Never put data from different dates on one AWL or one scale card. Even if only one scale is collected that day, begin a new card and AWL for the next day.
6. If weights are taken, they may be noted in the right margin of the AWL during sampling, but be sure to transfer the weights to the appropriate columns on the reverse of the AWL before submitting it to the ARB.
7. The data processing program uses the "litho code" on the AWL. (It is located in the lower left margin of the AWL.) It helps if the AWLs are used in the order of this code. It should not be hard to keep them in order if they are arranged that way before page numbering. Those who sample different areas throughout the season can arrange the litho codes in order before each sample is taken.
8. If AWLs get wrinkled or splotted they should be copied over before sending in. The optical scanning computer will misread or reject wrinkled sheets.

APPENDIX C

Kodiak Management Plan

*** NOT COMPLETED ***

To: All Kodiak escapement sampling crew-leaders:

Through: Dave Prokopowich, Kevin Brennen 

Fr: Pat Holmes

Date: May 20, 1992

Subj: Improved quality control for escapement sampling:

The increased use of scales for stock identification requires the highest quality scale samples. Only your crew can assure that this is accomplished. A few minutes of quality control in the field can save days of work in the office each fall.

A need exists to improve escapement sampling quality control. Most crews do acceptable to excellent scale sampling; in a few cases quality control was inadequate. Proper sampling and editing can prevent difficulties. Last season there were instances when entire samples were unacceptable. Samples were returned to the field camp for correction and scale remounting. Even when this occurred some of the data was worthless! Everyone makes occasional mistakes, but there is no excuse for sloppy work or repeated errors. If quality is not maintained it may be necessary to either increase the sample size or rotate crew members.

Reoccurring difficulties include: partial completion of AWLs; incorrect data recording; scale card which do not correspond with AWLs; scales that are: mounted backwards, upside down, out of sequence (lengths not corresponding with ages), taken from the non-preferred area, wrong species, and missing scales.

One of my roles during the field season is to assure high standards are met for escapement sampling. I will be looking at each sample as they come into town; they will be pressed soon after arrival for Patti to read in season. When I am in the field Patti Roche or Leslie Scott will examine the samples. We will try to provide immediate, positive and corrective feedback.

Forms which are incomplete will be returned for correction, you will be notified by radio to make appropriate corrections. Cards with scales that are mounted upside down or backwards will be pressed and then returned for proper mounting. The Area Management Biologists will be informed of needed corrections. Quality control problems will be logged with each sample. Input will be provided on evaluations regarding adherence to correct sampling procedures.

Here are a few ways that you could assist the improvement of the quality of the samples:

- 1) Advise your crew that they are responsible to complete the sampling tasks, sample and mount scales properly, and record data completely and accurately.**
- 2) If at all possible visit myself and Patti before you go in the field for a pre-season briefing, pickup sampling materials and the season's sampling plan.** We will answer any questions you might have. If you have any questions give me a call on the radio. I am only 10 minutes from the office in the evening.
- 3) Determine which of your crew are best suited for the three sampling jobs.** The neatest and most precise should do the scale sampling and fill out the opscan forms; the strongest should handle the wrestling.
- 4) Schedule time at the end of the season to discuss the season's work.** I would like to have your ideas on improvements and be able to provide feedback on the season's sampling. If repetitive errors have occurred it may be necessary to spend extra time correcting them before you go on leave.
- 5) Check all AWLs and scale cards before sending them in.**

If you have any suggestions that would improve sampling at your location or have any questions please let me know at any time. I will provide all the support I can. As time and budgets allows Dave, Kevin, Pete, or I visit your weir so that we can learn from your experience and provide any assistance we can to enhance operations.

Thank you for your support. Your dedicated effort toward collecting this valuable information while is always greatly appreciated.

1992 OPERATIONAL PLAN

KODIAK MANAGEMENT AREA

SOCKEYE AND COHO SALMON ESCAPEMENT SAMPLING

Length, Sex, and Scale Sampling Procedure for Sampling
Using Mark-Sense Forms

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

INTRODUCTION

Annually, sockeye salmon escapements are sampled for age, length, and sex from major and minor systems by field personnel within the Kodiak Management Area. Management and research biologists rely on this data for forecasting, escapement goal evaluation, catch apportionment, and run timing estimation. As the demand on our salmon resource increases, so does the intrinsic value of this data.

During the last several years, stock identification projects using scale pattern analysis have been conducted within the Alitak, Afognak, and Mainland Districts. The foundation for these projects are the scale samples that you collect. It is imperative that scales collected be of the highest quality possible.

The Opscan (AWL form scanner) machine does not allow for blanks, partially filled in sections or correction of errors present on the AWL forms. No one can collect the preferred scale or fill out AWL forms correctly but you. Several minutes of quality control during and immediately after the sampling event can literally save days of editing in the office.

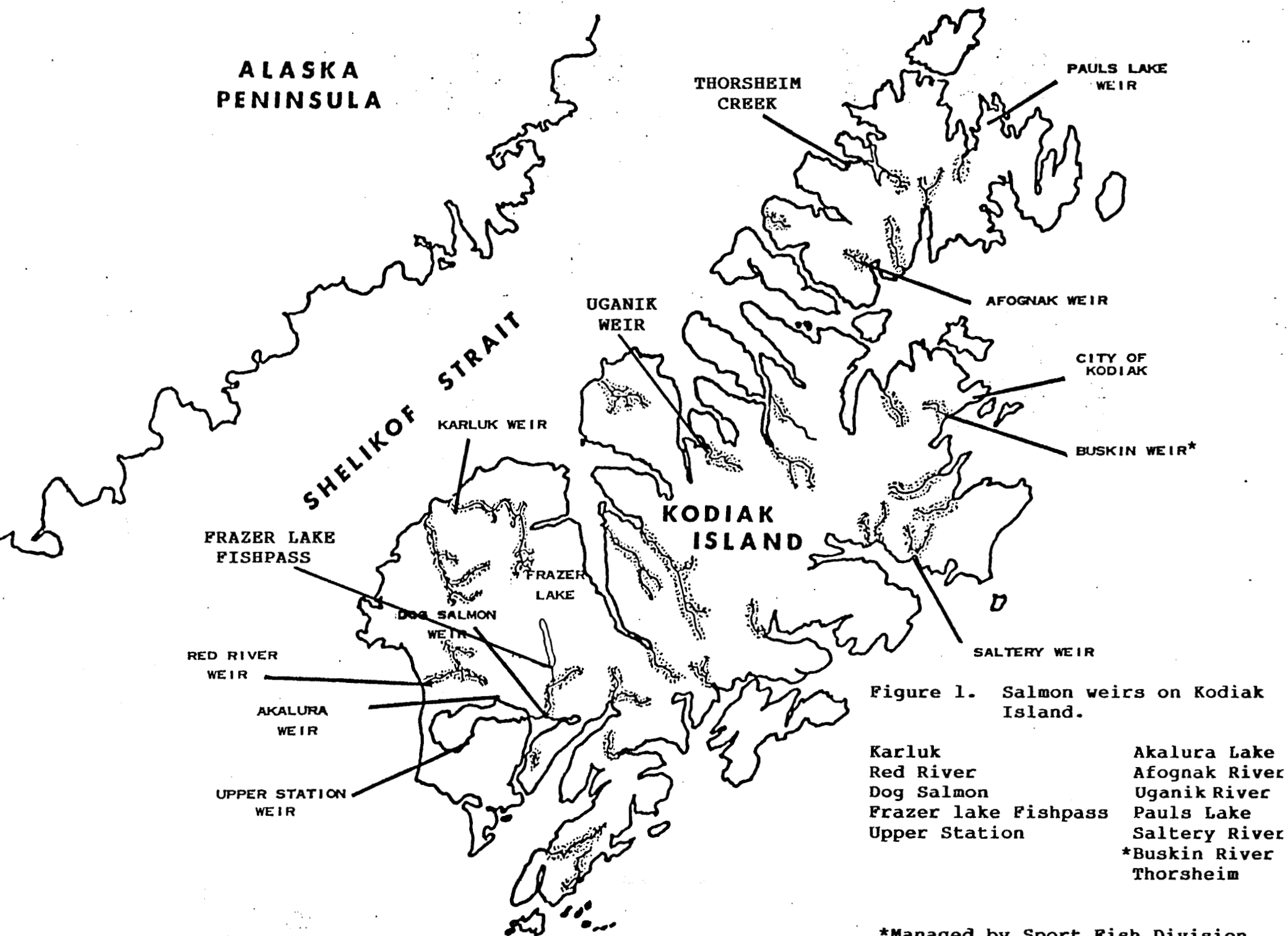
It is the crew leader in conjunction with the field crew's, responsibility to complete the sampling tasks, assure quality of scales, and data recording prior to samples being sent to town.

If questions or difficulties arise with regard to samples or proper procedures to follow for your specific location, please do not hesitate to contact biologists Pat Holmes, Charlie Swanton, or Patti Roche.

We can anticipate problems surrounding the large pink salmon run predicted to return from the 1990 escapements for several weir sites; any innovative ideas with reference to sampling or changes in the trap design will always be highly regarded (Figure 1). However, make sure that consistency between sampling weeks is maintained (i.e. no selection based upon sex, size, or coloration occurs). Your assistance and dedicated effort in collection of this valuable information is always appreciated.

OBJECTIVES

1. Determine age, length at age, and sex composition of selected sockeye escapements within the Kodiak Management Area. Similarly collect data for coho salmon escapements.
2. Results will be published in a Technical Fisheries Report by Charlie Swanton and Patty Roche.



*Managed by Sport Fish Division

SUPERVISION

Kodiak Area management staff Pat Holmes, Kevin Brennan, and Dave Prokopowich will oversee escapement sampling at all weir projects except Frazer and Akalura, which are the responsibility of Charlie Swanton. Pat Holmes will monitor weekly escapement sampling and review incoming data for completeness and scale mounting technique. When Pat is reassigned to other duties during early July, Patti Roche will do the quality control review. Weir crew leader's and the Area Biologist will be notified immediately regarding data quality.

A log book will be maintained concerning the quality of sampling and compliance with the sampling schedule. This documentation will be included in individual personnel evaluations.

PROCEDURES

Sockeye systems with weirs (Malina Lk.(FRED), Uganik R.(USFWS), Akalura Cr., Karluk R., Upper Station, Ayakulik R., and Fraser Lk.) will be sampled weekly for age, length and sex (ALS) (Figure 2, Table 1). A total of 240 fish per week will be collected on the 5th day (Thursday). If the required number of fish are not taken within a single day, obtain the balance of the sample on the following day (Friday). The spotty migration timing at Akalura may require an additional day's sampling during the early run. Notify the office if sampling difficulties occur that require changing this schedule; these changes should be noted in your log book and the comment section of the sampling data sheets. The crew leader will notify Dave Prokopowich or Kevin Brennan via SSB radio upon completion of weekly sampling.

Completed ALS data from Karluk weir will be mailed to Kodiak (return receipt from the Karluk village post office), and the office notified of mailing date.

Afognak weir personnel will collect 600 samples from both early and late sockeye run components. A single 600 fish sample will be collected at the Saltery weir during the peak escapement. Personnel will notify Pat Holmes if assistance is necessary.

Minor systems will also have escapement samples collected but with reduced intensity. The Pauls Lake staff will collect a 600 fish sample will be collected using a beach seine at the lake outlet near the peak of the run. Sport Fisheries Division (S.F.D.) personnel will sample 100 fish from the Buskin River, every two weeks, for six weeks (sample size specified by S.F.D biometrician).

There is no funding available for remote sampling. It will be conducted by Pat Holmes only if time and logistics allow sampling with out additional cost to the Department. Ideally 600 fish would

Figure 1. The "Scott" six panel salmon trap.

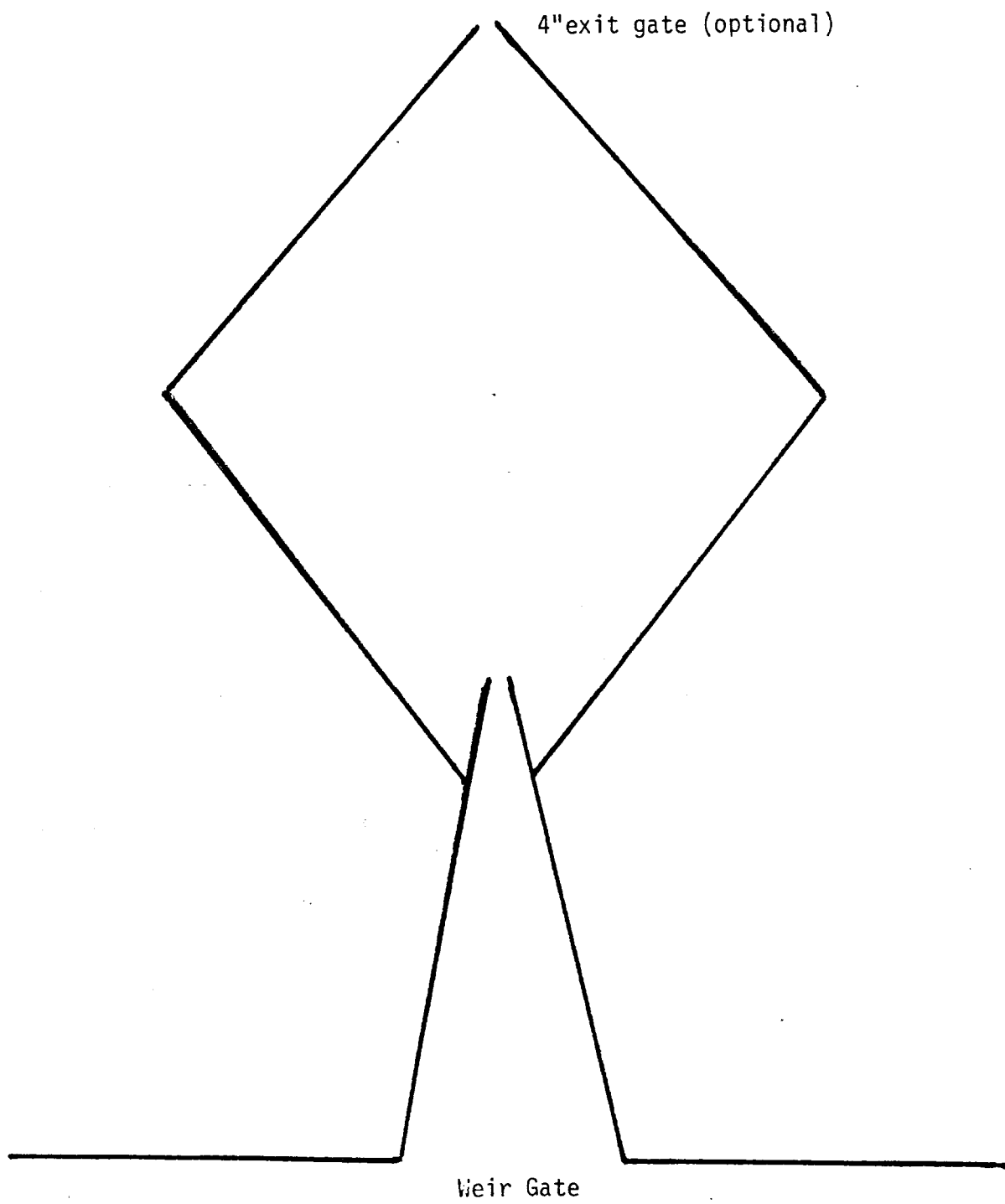


Table 1. Sockeye salmon escapement sampling schedule, 1992.

Location	Sampling Frequency	Date		Sample Size
		Starting	Ending	
Afognak weir (early)	once	June 9	June 15	600
Afognak weir (late)	once	July 14	July 20	600
Akalura weir (early) ^a	weekly	May 15	July 15	240
Akalura weir (late)	weekly	July 16	Sept 15	240
Buskin Lake weir ^b	once	June 30	July 13	240
Fraser Fishpass	once	June 15	August 30	240
Kaflia Lake ^c	once	July 7	July 20	600
Karluk weir	weekly	June 2	Sept 30	240
Little River Lake ^c	once	June 9	June 15	600
Malina Lake weir ^d	weekly	June 2	Sept.30	240
Pauls Lake weir	once	June 9	June 29	600
Red River weir	weekly	June 2	Sept 30	240
Saltery River weir	once	July 7	July 20	600
Thorshiem Creek ^c	once	June 30	July 13	600
Upper Station	weekly	June 2	Sept 30	240
Uganik Lake weir ^e	weekly	June 2	Sept.30	240

^a May require additional sampling time during early run.

^b Sampled by Sport Fisheries Division (Sample size determined by S.F.D. Biometrician)

^c Remote lake sampling not funded; will be conducted only if time and logistics allow.

^d Sampled by FRED.

^e Sampled by USFWS.

be collected from Little River, Thorshiem Creek (escapement or terminal seine catch), and Kaflia Lakes at or near peak escapement.

Coho escapement samples will be collected at Litnik, Karluk, Ayakulik, Upper Station, Dog Salmon, Pauls Bay, and Uganik River weirs. A total of 280 coho will be sampled (two scales per fish) at each location within a 10 day period during peak escapement. Pat Holmes will provide assistance at Saltery weir if requested. Sport Fisheries Division staff will sample 100 fish from the Buskin River, every two weeks, for six weeks; an alternate scenario is to beach seine fish in Buskin Lake (sample size specified by S.F.D biometrician).

It is essential that all ALS data be representative of the true escapement, therefore avoid bias by: NOT pre-selecting fish based upon size, sex, condition or any other factor. Data collection and recording procedures are presented in Appendices A and B. Weekly sampling schedules for 1992 are given in Table 1.

The following appendices provide an explanation of how samples should be collected. If you have not collected scales before, or if you have any questions ask Pat Holmes, Charlie Swanton, or Patti Roche to demonstrate the procedure. Scales must be readable and data must be recorded accurately to be useful.

SAMPLING SCENARIOS:

1. Differing size crews:

a. One person:

Wrestle the fish into the measuring board, wearing a glove on one hand. Measure and sex the fish. Remove a glove, pluck the preferred scale with the clean hand, release the fish, clean and mount the scale on the gum card in the card holder (which is kept in a protected place). Record the sex and length on "rite-in-the-rain" book or tape recorder (transfer the data to the AWL after sampling). A slime rag may be helpful.

b. Two persons:

One person can wrestle the fish, while the other records the data, plucks and mounts scales.

c. Three persons:

One person wrestles the fish, one plucks and mounts the scales, and the third records the data.

APPENDIX A
SCALE SAMPLING TECHNIQUES

SCALE SAMPLING

Scale cards

The scale card is a gum-backed sheet numbered 1 through 40. Scales from the sample are placed on the card with no attempt to separate the fish by sex.

Use the card holders provided to prevent the cards from getting wet during sampling. **The cards must be kept dry at all times.** A wet gum card may make the scales unreadable. If the weather is too bad, suspend sampling until dryer conditions prevail. When the card gets wet glue often obscures scale features and scales frequently adhere poorly to the card. In this situation the scales should be remounted on a new card. Cover the completed gum card with wax paper for storage, place the cards between two flat surfaces to prevent distortion.

A new, consecutively numbered, card is used each day, even if the previous card is not completed. **Scale cards numbers must match the corresponding AWL sheet.** Do not repeat the sample number during the season.

Fill out the gum cards as shown in Appendices A.1 and A.2.

Species:

Write out completely (i.e., sockeye, coho).

Locality:

For catch sampling and escapement sampling write down area in which fish were caught followed by "escapement" (i.e. Karluk River escapement).

Stat. Area and Sampling Date:

Transfer the appropriate numbers from the AWL form.

Gear:

Write out completely. (Weir/Trap, Beach Seine)

Collectors:

Record the first and last name of the person(s) sampling on the first AWL and scale card, initials are acceptable on latter cards and AWLS.

Remarks:

Record any pertinent information such as number of scales per fish sampled (1=sockeye, 2=coho, 4=chinook), factors affecting sampling, bears in the trap, difficulties sexing fish, ect. Transfer this same information to the top margin of the AWL.

Sampling

1. Take the preferred scale if it is available, if not note that the scale taken is not preferred (error codes on AWL). The "preferred scale" is located on the left side of the fish, two rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin (Appendix A.3). If the "preferred scale" is missing, select a scale within the preferred area on either the left or right side of the fish. If no

Species SOCKEYE Card No 001
 Locality AKALURA ESC.
 Stat. Code 257-30-302
 Sampling Date Mo 09 Day 16 Year 91
 Gear: BEACH SEINE
 Collector(s): HICKS KAPLAN PEARSON
 Remarks _____

10	9	8	7	6	5	4	3	2	1
20	19	18	17	16	15	14	13	12	11
30	29	28	27	26	25	24	23	22	21
40	39	38	37	36	35	34	33	32	31

SAMPLES = HICKS, KAPLAN, PEARSON(R)

DESCRIPTION: SOCKEYE/AKALURA/ESC.

ADFG ADULT SALMON AGE-LENGTH
FORM VERSION 2.1

CARD: 001

SPECIES: 2

DAY: 16

MONTH: 09

YEAR: 91

DISTRICT: 257

SUBDISTRICT: 30

STREAM: 302

LOCATION: AKALURA

PERIOD:

PROJECT: 3

GEAR: 2

MESH:

TYPE OF LENGTH MEASUREMENT: 2

NUMBER SCALES/FISH: 1

OF CARDS: 1

SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
1					
2					
3					
4					
5					
6					
7					
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9					
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100					

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229518

litho code

NCS DOCUSCAN® M820 17873 40 A4200

SPECIES

- 1 - Chinook (king)
- 2 - Sockeye (red)
- 3 - Coho (silver)
- 4 - Pink (humpy)
- 5 - Chum (dog)

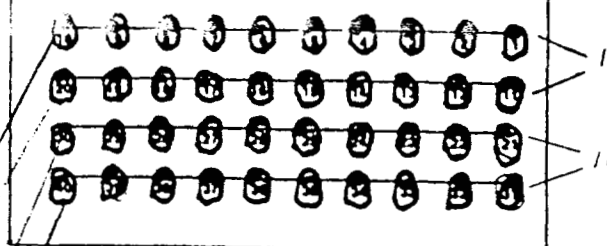
PROJECT

- 1 - Commercial catch
- 2 - Subsistence catch
- 3 - Escapement (tower, weir, sonar site, etc)
- 4 - Escapement - spawning grounds
- 5 - Test fishing
- 6 - Sport catch (marine)
- 7 - Sport catch (freshwater)

GEAR TYPE

- 8 - Trap
- 9 - Purse seine
- 10 - Beach seine
- 11 - Handpicked
- 12 - Dip net
- 13 - Set gillnet
- 14 - 15 Unassigned
- 16 - Beam trawl
- 17 - Shovel
- 18 - Weir
- 19 - Fishwheel
- 20 - 99 Unassigned
- 9 - Pots
- 10 - Sport hook and line

Species COHO Card No 001A
 Locality KARLUK ESC
 Stat Code 255-10-101-
 Sampling Date Mo 08 Day 29 Year 91
 Gear WEIR / TRAP
 Collector(s) T. STACK, S. BROWN, J. FOX
 Remarks 2 SCALES / FISH



DESCRIPTION: COHO / KARLUK / ESC
2 SCALES / FISH

SAMPLERS:
T. STACK - W
S. BROWN - P
J. FOX - R

ADF&G ADULT SALMON AGE-LENGTH
 FORM VERSION 2.1

CARD: 001A#B

SPECIES: COHO

DAY: 29

MONTH: 08

YEAR: 91

DISTRICT: 255

SUBDISTRICT: 10

STREAM: 101

LOCATION: 35

PERIOD: -

PROJECT: ESC

GEAR: WEIR / TRAP

MESH: -

TYPE OF LENGTH MEASUREMENT: 2

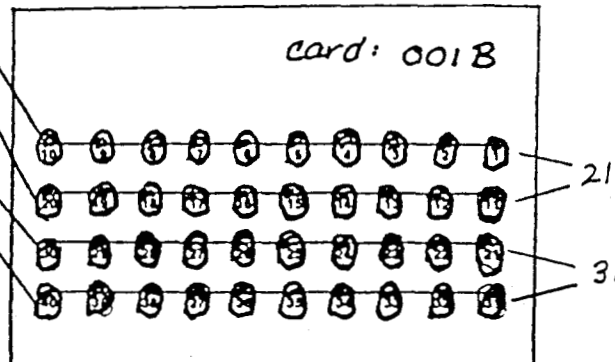
NUMBER SCALES / FISH: 2

OF CARDS: 1

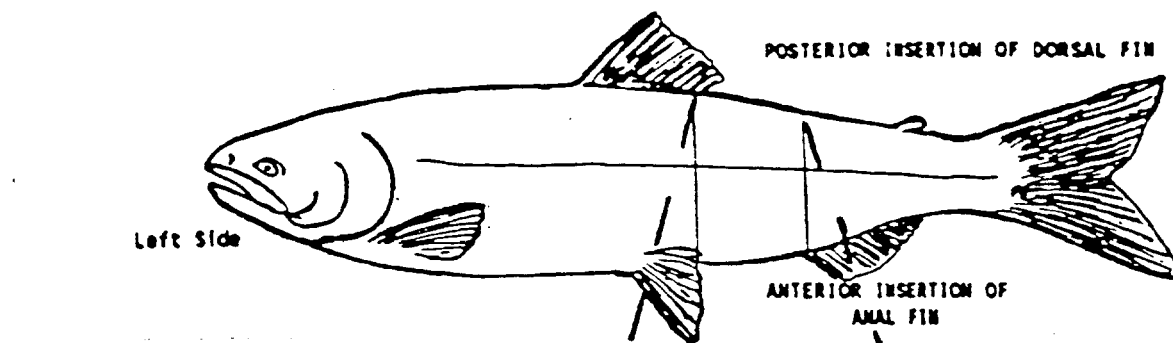
#	SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
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 DO NOT WRITE IN THIS AREA
 216854
 litho code

Species COHO Card No 001B
 Locality KARLUK ESC
 Stat. Code 255-10-101-
 Sampling Date Mo 08 Day 29 Year 91
 Gear: WEIR / TRAP
 Collector(s) T. STACK, S. BROWN, J. FOX
 Remarks 2 SCALES / FISH



Appendix A.3. Sampling procedure for the preferred scale.



Take the preferred scale on the left side of the fish, two rows above the lateral line and on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin.

If the preferred scale is missing take a scale again from the left (or) right side of the fish no more than four rows above the lateral line, within the preferred area, behind the dorsal fin and ahead of the anal fin.

If sampling more than one scale take the preferred scale and scale #2 and scale #3 as shown or the closest scale to that location.

PREFERRED AREA

Row 4

Row 2

PREFERRED SCALE

Note: Mount scales with the anterior portion (arches) of the scale pointed toward the top of the card.



Place the scales directly over the number on the gum card.

18	9	8	7	6	5	4	3	2	1
20	19	18	17	16	15	14	13	12	11
30	29	28	27	26	25	24	23	22	21
40	39	38	37	36	35	34	33	32	31

scales are present in the "preferred area" on both sides of the fish, sample a scale as close to the preferred area as possible and darken the 8 under age error code on the AWL form. **Do not take a scale from the lateral line they are creased and worthless for digitizing!**

2. Clean the scale by wetting it and rubbing it between your fingers. Make sure no dirt, slime or skin (no silver color) remain on the scale.
3. Mount the scale on the gum card with the ridged (rough) side up. The ridged (rough) side of the scale is the same side that is exposed on the salmon.
4. Mount scale with the annular ring arches up (Appendix A.3).
5. One scale will be taken from sockeye and two scales from coho (Appendix A.1, A.2). When taking multiple scales per fish sample the "preferred scale" and second scale one inch to the left of the "preferred scale," and two rows above the lateral line. Mount the 2 scales from fish #1 over 1 and 11 on the gum card as shown in Appendix A.2. Continuing, mount the 2 scales from fish #2 over 2 and 12, etc. If sampling 3 scales, mount the scales over #1, #11, #21, etc.
6. Scales should be neat, clean, and orderly.
7. CHECK EACH SCALE FOR CORRECT MOUNTING BEFORE SENDING IT TO TOWN. A light touch with your fingernail and a visual inspection of the orientation of the arches will reveal any problems. Remount the scales if necessary.

SCALE SAMPLING CHECKLIST		
Clipboard	Pencils (No. 2)	Measuring board or caliper
Gum Cards	Forceps	Sampling Manual
AWL's	Forceps	Plastic scale card holders
Gloves		

APPENDIX B

COMPLETING THE AGE-WEIGHT-LENGTH (AWL) FORMS:

AGE-WEIGHT-LENGTH (AWL) FORMS

Data must be recorded on the mark-sense forms neatly and accurately. Keep the mark-sense forms flat, dry, and clean. Fish gurry and water curling will cause data to be misinterpreted by the optical scanning machine. The forms should be neat and legible enough to have a stranger be able to make sense out of them.

When sampling a weired system you may use "rite-in-rain" books to record the data. Keep the mark-sense forms in camp where they will be clean, dry, and flat. After sampling is done for the day transfer the data to the mark-sense forms. **It is the responsibility of the data collector to transcribe the data before sending the forms to the office.**

A completed mark-sense AWL form and accompanying gum card for sampling sockeye is shown in Appendix B.1. A completed AWL form and accompanying gum cards for sampling coho salmon are shown in Appendix B.2.

Complete each section of the left side of the mark-sense form using a soft No. 2 pencil and darken the corresponding blocks as shown in the figures. Make every effort to darken the entire block, do not allow your marks to overlap the adjacent rows. Partially filled blocks are often missed by the optical scanner, overlapping marks on adjacent rows creates multiple numbers and error codes for the sampled fish. This causes a lot of problems for Patty Roche and Leslie Scott when they are processing the sample. Do not mark on the left hand margin of the form. Label only one form at a time to avoid "the carbon paper effect" and resulting stray marks. Do not attach any thing to the AWL with paper clips, this may cause the Opscan reader to miss-feed the form.

Description:

Species/Area/Escapement i.e. Sockeye/Karluk weir/Escapement

Samplers: W-(Wrestler) Name

P-(Scale plucker) Name

R-(Recorder) Name

List any factors relating to sampling, number of scales collected, bear in the trap, difficulties sexing fish, ect.

Card:

The AWL forms and corresponding gum card(s) are numbered sequentially by date throughout the season starting with 001. A separate numbering sequence will be used for each species and geographic location. Consult your crew leader for the current card number. The number of cards varies by species; sockeye samples use one card per AWL form (Appendix B.1), coho samples require two cards per AWL (Appendix B.2).

Species:

Refer to the reverse side of the AWL form for the correct number.

Day, Month, Year:

Use the date when the fish are caught.

District, subdistrict, stream number:

List only one district, subdistrict and stream number. I.e. for the Karluk weir: 255(district), 10(subdistrict), 101(stream number) Consult the Kodiak Area Statistical Area Chart for the appropriate district, subdistrict, and stream numbers. If you do not have the chart ask the Kodiak office for the correct numbers, do not leave these sectors blank.

Species SOCKEYE Card No 001
 Locality AKALURA ESC.
 Stat. Code 257-30-302
 Sampling Date Mo 08 Day 16 Year 91
 Gear: BEACH SEINE
 Collector(s): HICKS KAPLAN PEARSON
 Remarks _____

18	9	8	7	6	5	4	3	2	1
20	19	18	17	16	15	14	13	12	11
28	27	26	25	24	23	22	21	20	19
38	37	36	35	34	33	32	31	30	29

DESCRIPTION: SOCKEYE/AKALURA/ESC.

SAMPLES = HICKS, KAPLAN, PEARSON(R)

ADFG ADULT SALMON AGE-LENGTH
FORM VERSION 2.1

CARD: 001

SPECIES: 2

DAY: 16

MONTH: 09

YEAR: 91

DISTRICT: 257

SUBDISTRICT: 30

STREAM: 302

LOCATION: AKALURA

PERIOD:

PROJECT: 3

GEAR: 2

MESH:

TYPE OF LENGTH MEASUREMENT: 2

NUMBER SCALES/FISH: 1

OF CARDS: 1

SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
1					
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100					

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litho code

229518

HCS DOCUSCAN® M820 17877 W A4700

SPECIES

- 1 - Chinook (king)
- 2 - Sockeye (red)
- 3 - Coho (silver)
- 4 - Pink (humpy)
- 5 - Chum (dog)

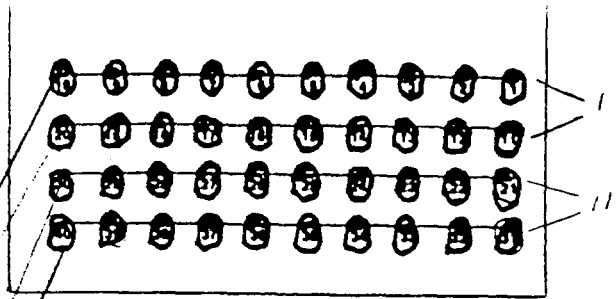
PROJECT

- 1 - Commercial catch
- 2 - Subsistence catch
- 3 - Escapement (lower, west, south site, etc)
- 4 - Escapement - spawning grounds
- 5 - Test fishing
- 6 - Sport catch (marine)
- 7 - Sport catch (freshwater)

GEAR TYPE

- 8 - Trap
- 9 - Purse seine
- 10 - Beach seine
- 11 - Handpicked
- 12 - Dip net
- 13 - Drift gillnet
- 14 - 18 Unassigned
- 15 - Beam trawl
- 16 - Long line
- 17 - Shovel
- 18 - Otter trawl
- 19 - Weir
- 20 - Fishhook
- 21 - Pots
- 22 - Sport hook and line
- 23 - 99 Unassigned

Species COHO Card No 001A
 Locality KARLUK ESC
 Stat Code 255-10-101-
 Sampling Date Mo 08 Day 29 Year 91
 Gear WEIR / TRAP
 Collector(s) T. STACK, S. BROWN, J. FOX
 Remarks 2 SCALES / FISH



DESCRIPTION: COHO / KARLUK / ESC
2 SCALES / FISH

SAMPLERS:
T. STACK - W
S. BROWN - P
J. FOX - R

ADF&G ADULT SALMON AGE-LENGTH
 FORM VERSION 2.1

CARD: 001A+B

SPECIES: COHO

DAY: 29

MONTH: 08

YEAR: 91

DISTRICT: 255

SUBDISTRICT: 10

STREAM: 101

LOCATION: 35

PERIOD: -

PROJECT: ESC

GEAR: WEIR / TRAP

MESH: -

TYPE OF LENGTH MEASUREMENT: 2

NUMBER SCALES / FISH: 2

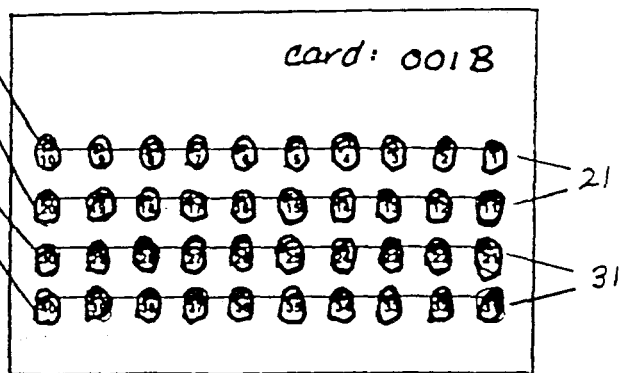
OF CARDS: 1

SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
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100					

DO NOT WRITE IN THIS MARGIN
 DO NOT WRITE IN THIS AREA
 216854
 litho code

NCS DOCUSCAN M820-17877 409 A5200

Species COHO Card No 001B
 Locality KARLUK ESC
 Stat Code 255-10-101-
 Sampling Date Mo 08 Day 29 Year 91
 Gear WEIR / TRAP
 Collector(s) T. STACK, S. BROWN, J. FOX
 Remarks 2 SCALES / FISH



Appendix B.2. AWL and scale cards for sampling 2 scales per fish.

Location:

List the appropriate code as shown on Appendix B.3. For example Karluk weir is (035).

Project:

Refer to the reverse side of the AWL form for the correct code for escapement sampling (3).

Gear:

Refer to the reverse side of the AWL form for the correct code (19).

Mesh:

Leave blank unless specifically instructed by supervisor to do otherwise.

Type of length Measurement:

Use (2) mid-eye to fork-of-tail, unless specifically instructed to do otherwise (Appendix B.4).

of cards:

Mark 1 when sampling sockeye and coho salmon (Appendix B.1, B.2). When sampling coho salmon write the card numbers (i.e. 001A, 001B,) as shown in Appendix B.2.

Sex:

Darken M or F in the sex columns. If any difficulty was encountered in this procedure, write "trouble sexing fish" on the top margin of the AWL and ask your supervisor for help as soon as possible before sexing additional fish.

Length:

Measure all length in millimeters from the middle of the eye to the fork of the tail, refer to Appendix B.4. Record length by blackening the appropriate column blocks on the AWL form. Column 3 on the AWL form is used for fish over 999 millimeters long. Measure all fish to the nearest mm. If you use calipers check them daily, before use, to ensure the accuracy of the measurements. **LENGTHS MUST REFLECT CORRESPONDING SCALES.**

Additional data columns:

Additional data may be recorded on the back of the AWL for individual project use. If you use them and wish that data to be read by the opscan reader, you will need to transfer the litho code from the front of the form to the back. Weights, if taken, should be noted in the right hand margin of the awl when during sampling and be transferred to the back of the awl sheet. Adipose clipped fish should have the head tag number recorded on the corresponding row in the first five columns on the reverse side of the AWL. Tagged fish that are sampled should also be recorded in this manner. Note all tagged fish observed in your log book.

After editing a form, place your initials next to card #, but not in left margin.

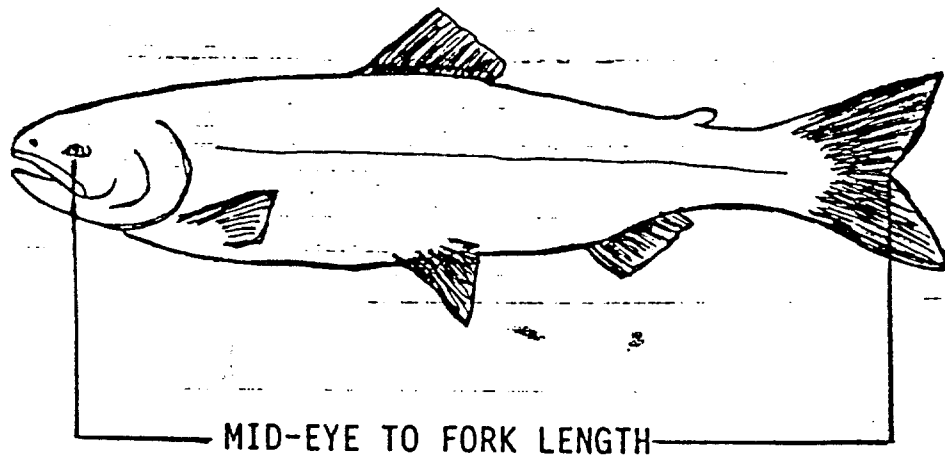
As soon as possible after completion send the samples and mark-sense forms to the office in Kodiak. During scheduled radio calls before sending the data in, the crew leader will notify the area biologist: 1) that the data is being mailed (use a moisture-proof container); 2) what data is being sent; 3) when delivery is expected in Kodiak; and 4) who is transporting the data. It is important that these steps are followed to ensure delivery.

Appendix B.3. Assigned port and weir location codes.

Port and Location Codes

030 - Lazy Bay
031 - Port of Kodiak
032 - Pauls Lake
033 - Thorshiem
034 - Afognak River
035 - Karluk River
036 - Red River
037 - Upper Station
038 - Frazer Lake
039 - Dog Salmon
040 - Akalura River
041 - Uganik River
042 - Malina Creek
150 - King Cove
151 - Port Moller
052 - Dutch Harbor
053 - Akutan
054 - Sand Point
055 - Bear River, ADF&G Camp
056 - Nelson River, ADF&G Camp
057 - Canoe Bay

Appendix B.4 Measuring fish length, mid-eye to fork of tail.



Mid-eye to fork lengths are taken because the length and shape of a salmon's snout changes as it approaches sexual maturity. The procedure for measuring by this method follows:

- 1) Place the salmon flat on its right side, with its head to your left and the dorsal fin away from you.
- 2) The eye should be on the line projecting from the end of the meter stick. Hold the head in place with your right hand. Sometimes you can control the fish better by placing your thumb in the fish's mouth.
- 3) Flatten and spread the tail against the board with your right hand.
- 4) Read the mid-eye to fork length to the nearest millimeter.

REMINDERS

1. AWLs should be carefully edited. Re-check header information on AWLs; make sure all available information is filled in. Take extra care to use the correct statistical week for the sampling or catch date. Page numbers should not be repeated; a frequent error is to begin a week's sample with the last page number used the week before. Take time to ensure that the boxes are being blackened correctly. Keep marks within each rectangle and completely fill them. After AWLs are edited, place editor's initial next to page number, but not in left margin.

Before sending data forms in, look down the form from two angles to pick up any glaring mistakes.

2. Mount the scales correctly, with anterior end (arches up) toward top of scale card with the ridged (rough) side out.
3. Make sure the error codes are correct. Error code 7 is wrong species, error code 8 is non-preferred scale. **Error code 6 is for the use of the scale reader,** it refers to the reabsorption of the scale.
4. Transfer important comments from scale cards to AWLs. Important remarks can be lost; after pressing scales, the cards are seldom referred to again. Write comments in the top margin (not on the left side). If there is not room on the AWL to completely explain the remarks, use a separate piece of paper.
5. Never put data from different dates on one AWL or one scale card. Even if only one scale is collected that day, begin a new card and AWL for the next day.
6. If weights are taken be sure to transfer the weights and litho codes to the appropriate columns on the reverse of the AWL before submitting it to the office.
7. If possible Keep the litho code in order. The data processing program uses the "litho code" to track the data files. (It is located in the lower left margin of the AWL.) Keep them in order before numbering the pages.
8. Recopy all wrinkled or splotched AWLs before sending them in. The optical scanning computer will misread, reject, or destroy damaged sheets.

The responsibility for accuracy lies first with the primary data collector(s). Sloppy or incomplete data will be returned to individual collectors. Compliance with the sampling procedures and schedule will be noted in each samplers evaluation.

OPERATIONAL PLAN
ALITAK BAY JUNE SOCKEYE SALMON
TEST FISHERY FOR 1992

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

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INTRODUCTION

In the Alitak Bay District of the Kodiak Management Area there are two early sockeye runs, the Upper Station and the Frazer Lake run. Both occur simultaneously. Typically, the Frazer Lake run is dominate. Both runs contribute to important west side Kodiak salmon fisheries mainly in the Alitak Bay District in June and early July. A reliable in-season estimate of the early run strength to these systems is necessary to maximize harvest potential and ensure optimum escapement. Currently the primary in-season method for assessing run strength is a combination of the escapement counts at the Dog Salmon and Upper Station weirs, aerial surveys of escapement build-up on the Dog Salmon River flats, and the 9 June Alitak Bay District commercial catch. The information has not always been timely enough to ensure maximum harvest and optimum escapement. An in-season test fishery in conjunction with scale pattern analysis in upper Moser Bay should provide an accurate in-season guage of the run strength and timing of the Frazer Lake and Upper Station early run stocks.

OBJECTIVES

1. Determine the daily number of early run sockeye salmon entering Olga Bay.
2. Periodically, inseason, determine the stock origins of the early sockeye run entering Olga Bay.

TASKS

1. Fish a 50-fathom 4 3/4 mesh set gillnet with 100 ft. lead three hours daily at high tide.
2. Sample the test-fish catch for scales, age, and length data.
3. Construct a statistical model which provides good classification accuracy for distinguishing Upper Station and Frazer age 2.2 and 2.3 scale patterns.
4. Digitize the age 2.2 and age 2.3 scale patterns of the test-fish catch and Cape Alitak catch samples.

PROCEDURES

Test fishing will be conducted daily from 29 May through 15 July on the northeast side of Chip Cove in upper Moser Bay (Figure 1). A 50 fathom, 40 mesh deep, 4.75 inch stretch mesh gillnet attached to a 100 ft. lead will be fished daily at the location for three hours each day, irrespective to whether a commercial opening is in progress. The daily set will begin on the flood 1.5 hrs. before high tide and end on the ebb 1.5 hrs. after high tide. The sequence will be to fish every other high tide except that there will be no night fishing. When a high tide at night falls within the sequence, the previous high tide will be fished, and the sequence of fishing every other tide will re-start from that tide. Fishing will be discontinued during a set if more than 250 sockeye

salmon are in the net. In addition to the catch, associated climatological and fishing conditions will be recorded on the form in Figure 2.

High tide time and height for Chip Cove will be determined using the correction factors for Moser Bay (Time: +0:13; height: x 1.39) as applied to Kodiak tides (Appendix A).

The gillnet used in the test fishery will be maintained in good condition throughout the season. Therefore daily, the gillnet will be inspected, cleaned, and repaired as required to ensure the net is in good fishing condition.

All set net caught fish will be sold to the processor at Alitak. The fish ticket receipts will be issued to the State of Alaska, Department of Fish and Game, Division of Commercial Fisheries, Kodiak. Prior to delivering the catch to the processor, the sockeye salmon will be catch sampled for age (two-scales per fish), length, and sex. Within 24 hours of sampling the scales will be aged.

Linear discriminant analysis using scale measurements will be used to determine rivers origin of the sockeye salmon caught in the test fishery and Alitak District commercial catch. An age 2.2 stock separation model will be developed. The standards will be 200 age-2.2 scales from the 1992 early run Upper Station escapement and 200 age-2.1 scales from the 1991 Frazer Lake escapement. Alternatively, the age 2.2 standards will be developed using age 2.0 smolt samples from the 1990 outmigration. Age-2.2 fish are expected to comprise 58% of the Upper Station and 37% of the Frazer Lake runs in 1992 (Table 1). Age 2.3 stock model will also be developed.

Figure 2. Test fish catch reporting form.

SET NET SITE: _____

YEAR: _____

DATE	FISHING TIME 1/			CATCH			WEATHER 2/								SECCHI DISK (meter)	REMARKS 2/
							TIDE		Wave Height (Ft.)	Wind Dir.	Wind Vel. (mph.)	TEMPERATURE		% Cloud Cover		
	Start	End	Total Min.	Sockeye	Chum	Other	Ht.	Time				Air	Water			

a/ Record to the nearest minute and specify a.m. or p.m.

b/ Use standard tide tables with correction factor for Moser Bay. Record cloud cover to nearest 10%; wave height to nearest foot; wind direction from compass bearing; wind velocity to nearest 5 mph; and temperature to nearest degree.

c/ Note the travel direction for the majority of the fish hitting the net.

The standards will be 200 age 2.2 Upper Station and Frazer Lake scales sampled in the 1991 escapement. Age 2.3 fish are expected to be 31% of the Upper Station and 58% of the Frazer Lake run in 1992. The age specific scale impressions will be projected at 200X onto a digitizing tablet to measure the distances between circuli and record the number of circuli in the first freshwater annulus and the second freshwater annulus. Once these variables are measured, age 2.2 and 2.3 a stock separation models will be constructed that provide high discrimination between Upper Station and Frazer Lake fish. In-season the age-2.2 and 2.3 discriminant models will be applied to successive aggregates of 100 (age specific) digitized unknowns from each sample to estimate the Frazer Lake and Upper Station components. All point estimates will be adjusted for misclassification errors using the procedure of Cook and Lord (1978), while 90% confidence intervals around the estimates will be computed using the procedure of Pella and Robertson (1979).

Stock compositions of test and commercial catches other than for the age-2.2 and age 2.3 fish will be estimated by combining the results from the scale pattern analysis with the age composition of the forecasted Upper Station and Frazer Lake runs (Table 1). The underlining assumption will be that the stock composition of the minor ages will be the same as estimated for the age-2.2 and age-2.3 combined. Stock composition estimates based on scale pattern analysis results will be made within 24 hours after the collection of each 100 fish age-2.2 and age 2.3 sample. The latest target date for the first stock composition estimate is 7 June. If a total of 100 or more age-2.2 and age 2.3 fish have not been caught in the test fishery by 5 June and provided the age discriminant models have been developed, test fishing time will be extended on 5 July until the required samples are obtained.

Table 1. Age composition of the 1992 run forecast for Frazer Lake and early Upper Station sockeye salmon.

System	<u>Percent Age Composition</u>				Total Run Number
	1.2	1.3	2.2	2.3	
Frazer Lake	3.4	1.1	37.2	58.4	1,080,105
Early Upper Station	5.7	5.6	57.8	30.9	100,597

REPORTING

Daily, the catch data will be recorded on a standard form (Figure 2) and also radioed to the Department's Kodiak office via the 3230 frequency. The daily radio report will cover the number of fish caught by species and the total number of minutes fished. Age and stock composition estimates will be transmitted when requested.

Daily test fish catch reports will be posted for the fishermen at Alitak.

LITERATURE CITED

- Cook, R. and G. Lord. 1978. Identification of stocks of Bristol Bay sockeye salmon by evaluating scale patterns with a polynomial discriminant method. U.S. Fish and Wildlife Service, Fisheries Bulletin 76(2): 415-423.
- Fishery, R. 1936. The use of multiple measurements in taxonomic problems. Annual Eugenics 7:179-188.
- Pella. J. and T. Robertson. 1979. Assessment of composition of stock mixtures. Fishery Bulletin 77(2):387-398.

APPENDIX A
KODIAK TIDES TABLES

KODIAK TIDES

May 1992

Date	HIGH TIDES				LOW TIDES			
	A.M.	FT.	P.M.	FT.	A.M.	FT.	P.M.	FT.
1 Fri	1:24	8.7	2:18	7.1	8:00	-5	7:47	1.6
2 Sat	1:57	9.2	2:59	7.2	8:38	-1.1	8:23	1.7
3 Sun	2:32	9.5	3:41	7.2	9:17	-1.5	9:00	1.8
4 Mon	3:08	9.7	4:24	7.1	9:58	-1.7	9:39	2.0
5 Tue	3:47	9.7	5:10	6.9	10:41	-1.7	10:22	2.2
6 Wed	4:31	9.4	6:01	6.7	11:28	-1.4	11:12	2.5
7 Thu	5:19	9.0	6:56	6.6	—	—	12:19	-9
8 Fri	6:16	8.3	7:58	6.7	0:11	2.7	1:14	-4
9 Sat	7:25	7.6	9:01	7.0	1:24	2.8	2:14	-1
10 Sun	8:47	7.0	10:01	7.5	2:47	2.5	3:17	-5
11 Mon	10:12	6.7	10:55	8.1	4:11	1.8	4:18	-9
12 Tue	11:29	6.7	11:44	8.7	5:22	-9	5:16	1.2
13 Wed	—	—	12:34	6.8	6:21	-1	6:08	1.4
14 Thu	0:29	9.2	1:30	7.0	7:12	-8	6:56	1.6
15 Fri	1:12	9.6	2:20	7.1	7:58	-1.4	7:40	1.8
16 Sat	1:53	9.8	3:06	7.2	8:41	-1.7	8:22	-1.9
17 Sun	2:32	9.7	3:49	7.1	9:22	-1.7	9:02	2.1
18 Mon	3:10	9.5	4:31	7.0	10:01	-1.6	9:42	2.4
19 Tue	3:48	9.2	5:13	6.7	10:41	-1.2	10:22	2.6
20 Wed	4:26	8.7	5:55	6.5	11:20	-8	11:04	2.9
21 Thu	5:06	8.1	6:40	6.4	12:00	-2	11:51	3.1
22 Fri	5:48	7.5	7:26	6.3	—	—	12:41	-2
23 Sat	6:37	6.8	8:15	6.4	0:46	3.2	1:24	-8
24 Sun	7:36	6.2	9:05	6.6	1:51	3.2	2:11	1.3
25 Mon	8:49	5.7	9:53	6.9	3:04	2.9	3:01	1.7
26 Tue	10:08	5.5	10:37	7.4	4:16	2.4	3:53	2.0
27 Wed	11:20	5.5	11:20	7.9	5:16	1.6	4:45	2.2
28 Thu	—	—	12:22	5.8	6:08	-7	5:35	2.3
29 Fri	0:01	8.5	1:14	6.1	6:54	-1	6:23	2.4
30 Sat	0:42	9.0	2:02	6.5	7:37	-9	7:09	2.3
31 Sun	1:23	9.5	2:47	6.8	8:19	-1.5	7:54	2.2

● ○ ● ○ Light Type A.M. Tides
2 9 16 24 - 44 - Bold Type P.M. Tides

KODIAK TIDES

June 1992

Date	HIGH TIDES				LOW TIDES			
	A.M.	FT.	P.M.	FT.	A.M.	FT.	P.M.	FT.
1 Mon	2:06	9.9	3:32	7.0	9:02	-2.0	8:40	2.1
2 Tue	2:49	10.1	4:16	7.2	9:46	-2.2	9:27	2.1
3 Wed	3:35	10.0	5:02	7.3	10:30	-2.2	10:17	2.1
4 Thu	4:23	9.7	5:49	7.4	11:15	-1.9	11:11	2.1
5 Fri	5:14	9.1	6:38	7.5	—	—	12:02	-1.4
6 Sat	6:11	8.3	7:30	7.7	0:12	2.1	12:50	-7
7 Sun	7:16	7.3	8:25	7.9	1:21	2.0	1:41	-1
8 Mon	8:32	6.5	9:21	8.2	2:37	1.7	2:36	-9
9 Tue	9:55	5.9	10:16	8.6	3:55	1.2	3:34	1.6
10 Wed	11:17	5.8	11:10	8.9	5:07	-5	4:34	2.1
11 Thu	—	—	12:28	5.9	6:09	-1	5:33	2.4
12 Fri	0:01	9.1	1:26	6.2	7:02	-7	6:28	2.5
13 Sat	0:48	9.3	2:16	6.4	7:48	-1.1	7:18	2.6
14 Sun	1:32	9.4	3:00	6.6	8:30	-1.4	8:03	2.5
15 Mon	2:13	9.4	3:39	6.8	9:09	-1.5	8:45	2.5
16 Tue	2:52	9.3	4:17	6.9	9:46	-1.4	9:25	2.5
17 Wed	3:30	9.1	4:53	6.9	10:21	-1.2	10:05	2.5
18 Thu	4:07	8.7	5:28	6.9	10:55	-9	10:46	2.6
19 Fri	4:43	8.2	6:04	6.9	11:28	-5	11:29	2.6
20 Sat	5:22	7.6	6:39	7.0	—	—	12:01	-0
21 Sun	6:03	6.9	7:17	7.0	0:17	2.7	12:35	-5
22 Mon	6:51	6.2	7:57	7.2	1:11	2.6	1:11	1.1
23 Tue	7:52	5.5	8:42	7.4	2:12	2.5	1:51	1.7
24 Wed	9:09	5.1	9:31	7.6	3:21	2.1	2:39	2.2
25 Thu	10:35	4.9	10:23	8.0	4:30	1.5	3:37	2.6
26 Fri	11:52	5.2	11:16	8.5	5:32	-7	4:40	2.8
27 Sat	—	—	12:55	5.6	6:27	-1	5:42	2.8
28 Sun	0:09	9.1	1:46	6.1	7:16	-1.0	6:40	2.6
29 Mon	0:59	9.7	2:32	6.6	8:03	-1.7	7:34	2.3
30 Tue	1:49	10.1	3:16	7.1	8:47	-2.2	8:26	1.9

● ○ ● ○ Light Type A.M. Tides
1 7 15 23 30 - 45 - Bold Type P.M. Tides

KODIAK TIDES

July 1992

Date	HIGH TIDES				LOW TIDES			
	A.M.	FT.	P.M.	FT.	A.M.	FT.	P.M.	FT.
1 Wed	2:37	10.4	3:58	7.6	9:30	-2.5	9:18	1.6
2 Thu	3:26	10.3	4:41	8.0	10:13	-2.4	10:10	1.3
3 Fri	4:16	9.9	5:24	8.3	10:55	-2.0	11:05	1.1
4 Sat	5:07	9.1	6:08	8.5	11:38	-1.3	—	—
5 Sun	6:02	8.1	6:55	8.6	0:02	1.1	12:21	-5
6 Mon	7:02	7.0	7:45	8.6	1:06	1.0	1:06	-4
7 Tue	8:13	6.1	8:40	8.6	2:16	1.0	1:55	1.4
8 Wed	9:38	5.4	9:39	8.5	3:32	-8	2:52	2.2
9 Thu	11:06	5.2	10:41	8.6	4:48	-5	3:58	2.8
10 Fri	12:23	5.4	11:39	8.7	5:56	-0	5:07	3.0
11 Sat	—	—	1:22	5.8	6:52	-3	6:11	3.0
12 Sun	0:31	8.8	2:08	8.2	7:38	-7	7:04	2.9
13 Mon	1:18	9.0	2:46	8.5	8:17	-1.0	7:50	2.6
14 Tue	2:00	9.1	3:20	8.8	8:53	-1.1	8:32	2.4
15 Wed	2:38	9.1	3:52	7.1	9:25	-1.1	9:10	2.2
16 Thu	3:14	8.9	4:22	7.3	9:55	-1.0	9:47	2.0
17 Fri	3:49	8.6	4:52	7.4	10:25	-8	10:25	1.9
18 Sat	4:23	8.2	5:21	7.5	10:53	-4	11:03	1.9
19 Sun	4:58	7.6	5:50	7.5	11:21	-0	11:45	1.9
20 Mon	5:35	6.9	6:21	7.6	11:50	-6	—	—
21 Tue	6:17	6.2	6:56	7.6	0:30	1.9	12:20	1.2
22 Wed	7:09	5.5	7:38	7.7	1:24	1.8	12:55	1.8
23 Thu	8:20	4.9	8:30	7.8	2:29	1.7	1:40	2.4
24 Fri	9:56	4.6	9:34	8.0	3:44	1.4	2:41	2.9
25 Sat	11:28	4.9	10:42	8.4	4:59	-7	3:58	3.1
26 Sun	12:36	5.4	11:46	9.0	6:03	-1	5:16	3.0
27 Mon	—	—	1:26	6.1	6:56	-9	6:24	2.5
28 Tue	0:44	9.6	2:10	6.9	7:43	-1.6	7:23	1.9
29 Wed	1:37	10.1	2:51	7.6	8:27	-2.1	8:16	1.2
30 Thu	2:28	10.3	3:31	8.3	9:09	-2.3	9:08	-6
31 Fri	3:17	10.2	4:10	8.8	9:49	-2.1	9:59	-1

● ○ ● ○ Light Type A.M. Tides
7 14 22 29 - 45 - Bold Type P.M. Tides

Corrections

	TIME		FEET	
	HIGH	LOW	HIGH	LOW
KODIAK and AFOGNAK ISLANDS continued.....				
Kishuyak Point	+0.09	+0.12	+0.9	+0.2
Ouzunkie, Spruce Island	-0.01	-0.01	+0.5	+0.1
Spruce Island (North Side)	+0.06	+0.11	+0.7	+0.2
KODIAK, Kodiak Harbor See Kodiak Table				
St. Paul Harbor	-0.07	-0.03	-0.2	+0.1
Womens Bay	+0.04	+0.01	-0.3	+0.1
Ugik Bay (Gaffney Cove)	-0.25	-0.17	0.0	0.0
Port Harbor, Sitkalidak Island	-0.14	-0.03	0.0	+0.2
Three Saints Bay	-0.18	-0.10	+0.1	+0.2
Jap Bay	-0.13	-0.06	0.0	+0.2
Sitkinak Lagoon	-0.16	+0.10	-0.7	+0.3
Lazy Bay, Adak Bay	+0.02	+0.18	X1.41	X1.41
Moser Bay (Trap Point)	+0.13	+0.32	X1.39	X1.39
Olga Bay (A.P.A. Cannery)	+0.48	+1.16	X0.14	X0.14
ALASKA PENINSULA				
Kanatak Lagoon, Portage Bay	-0.25	+0.54	+3.3	+0.4
Lees Cabin, Wide Bay	+0.25	+0.35	+3.5	+0.3
Anchorage Bay	+0.23	+0.43	+0.5	+0.4
Three Star Point	+0.32	+0.40	X0.93	X0.93
Chiochi Island (east side)	+0.26	+0.40	X0.92	X0.92
Kupreanof Harbor, St. Paul Is.	+0.23	+0.38	X0.92	X0.92
Fox Bay, Kupreanof Peninsula	+0.22	+0.36	X0.89	X0.89
Shumagin Islands				
Korovin Island (east side)	+0.26	+0.52	X0.92	X0.92
Sanborn Harbor, Nagai Is.	+0.36	+0.37	X0.86	X0.86
Mist Harbor, Nagai Is.	+0.35	+0.38	X0.83	X0.83
Prate Cove, Popof Island	+0.42	+0.43	X0.88	X0.88
Sand Point, Popof Island	+0.30	+0.42	X0.87	X0.87
Zachary Bay, Unga Island	+0.34	+0.49	X0.88	X0.88
Albatross Anch., Balboa Bay	+0.32	+0.43	X0.91	X0.91
Beaver Bay	+0.37	+0.42	X0.87	X0.87
Seal Cape, Coal Bay	+0.34	+0.45	X0.84	X0.84
Ukoinak Island	+0.41	+0.40	X0.83	X0.83
Dolgai Harbor, Dolgai Island	+0.44	+0.40	X0.79	X0.79
Settlement Point, Pavlov Bay	+0.43	+0.48	X0.84	X0.84
Canoe Bay, Pavlov Bay	+1.36	+1.30	X0.76	X0.76
King Cove	+0.40	+0.42	X0.80	X0.80
Lensard Harbor, Cold Bay	+0.46	+0.57	X0.85	X0.85
Cold Bay	+0.49	+1.03	X0.84	X0.84
Monthoval Bay	+0.50	+0.43	X0.80	X0.80
Sanak Islands				
Peterson Bay	+0.29	+0.32	X0.73	X0.73
Sanak Harbor	+0.48	+0.43	X0.78	X0.78
ALEUTIAN ISLANDS				
Unimak Island	+0.49	+0.55	X0.77	X0.77
Dora Harbor	+0.43	+0.45	X0.78	X0.78
Iratan Bay				

Appendix A.1. Standard tide tables for Kodiak 1992 with correction factors for other Kodiak areas.

OPERATIONAL PLAN
AKALURA, UPPER STATION, AND RED LAKES
SOCKEYE SMOLT STUDIES, 1992



Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

MAY 1992

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INTRODUCTION

In 1989 the commercial sockeye salmon (*Oncorhynchus nerka*) fisherys were curtailed in most of the Kodiak Management Area due to oil contamination from the 24 March 1989 EXXON VALDEZ spill. As a consequence several sockeye systems had excessive escapements. For example, the Red Lake system where the escapement objective is 200,000 to 300,000 fish had a 770,000 escapement, and the Akalura system where the escapement objective is 30,000 to 50,000 fish had a 110,000 escapement. There is concern that the large escapements may damage future returns by a combination of factors in the freshwater environment including disease, fry starvation, and shifts in the plankton community caused by excessive predation. The project covered here addresses sockeye smolt production.

Goal

The goal is to determine whether smolt production has been impacted due to surplus sockeye escapement in 1989 at Akalura Lake and Red Lake using Upper Station Lake for a control. Specific objectives and tasks are:

Objectives

1. Accurately, estimate the total number of smolt in the out-migration;
2. Accurately, estimate smolt age composition and average smolt weight, length, and condition factor by age class;

3. Accurately, determine smolt out-migration timing.
4. Determine if smolt abundance estimates as derived from index trap are accurate.
5. Estimate seasonal use of nearshore areas of Red Lake by young-of-year sockeye salmon fry.

Tasks

1. Operate a Canadian fan trap continuously through the smolt migration;
2. Quantify the daily catch by species;
3. Sample 70 sockeye smolt per day, six days each week, for age, length, and weight through the migration;
4. One day each week, mark and release 500 sockeye smolt using Bismark Brown Y dye approximately 0.5 miles upstream of the index trap to determine trap efficiency;
5. **At Red Lake only** collect and preserve 300 sockeye smolt for microstructural analysis of otolith patterns.
6. At Red Lake, set-up and operate a full smolt counting weir for approximately 30-days with the purpose of individually counting all outmigrating smolt.
7. At Red Lake, using a fifty foot seine, weekly sample four field selected lake shoal areas to index sockeye salmon fry abundance and growth.

SUPERVISION

The Project Leaders are Bruce Barrett and Charles Swanton. The field staff and crew leaders are:

Akalura	Bruce McIntosh	- Crew Leader
	Jeff Wadle	- Crew

Upper Station	Don Pitcher	- Crew Leader - Crew
Red Lake	Rod Cambell Kim Phillips Ken Bowens	- Crew Leader - Crew - Crew - Crew - Crew

The crew leaders are responsible for making daily work assignments and ensuring that operations are conducted safely and according to the standards defined in this manual. Swanton, Barrett, and Roche will administratively oversee the program which will include ensuring that adequate logistic, equipment, and technical support are provided.

PROCEDURES

Trap Location, Set-up, and Maintenance

A Canadian fan trap will be fished at the outlet stream of each lake except at Red Lake where two traps will be used. The Akalura smolt trap will be fished in the first stream riffle upstream of the adult salmon weir site which is at the upper limit of intertidal influence. The Upper Station trap will be sited in the outlet stream of Lower Upper Station Lake about 1/2 mile below the lake. The Red Lake traps will be in the outlet creek one mile below the lake. All traps are to be operating by 7 May 1992. Generally each trap will be situated mid channel and at the tail of a riffle where velocity (>1 ft/sec) and depth (>1 ft.) are sufficient for enough flow through the trap to minimize fish avoidance problems. Depending on the flow conditions and size of the trap aperture, perforated smolt panels may be used for leads to enhance trap efficiency. After the initial set-up and evaluation, if a trap is repositioned or lead material is added or deleted the

action should be well documented in the comment section of the daily catch reporting form (Figure 1). This is important because of the likely change in the gear efficiency.

Each trap will be checked as often as necessary to maintain the trap efficiency and minimize any fish mortalities. Minimally, the traps should be checked every 30 minutes between the hours of sunset and sunrise. During daylight hours a check once every four hours is usually adequate. Although smolt generally outmigrate in the evening hours, there is evidence of large smolt movements occurring in hours of mid afternoon coinciding major weather changes including rain storms. It is essential that each crew keep a close vigilance on the assigned smolt trap. Unfortunately there are numerous instances where crew vigilance has been less than desirable and thousands of smolts have been overcrowded and killed solely due to crew inattentiveness.

Quantification and Species Identification of Trap Catch

There are two methods for determining the number of fish caught in a trap by species. The simplest and most common procedure is to individually count the fish by species while emptying the live box with a dip net. More specifically, the catch is transferred by dip net into a partially water filled 5-gallon plastic bucket and the fish are individually counted in the process of spilling the contents of the bucket in the stream below the trap. The second method involves a catch-weight sampling procedure where the catch is transferred by dip net into a small mesh netted basket suspended over the creek from a hanging scale. The aggregate weight of the catch is then recorded and the process is continued until the live box is emptied. During the catch-weight sampling process samples are taken to determine species count by weight. This involves

DAILY SMOLT CATCH REPORTING FORM

TRAP NUMBER	PROJECT LOCATION	DATE
_____	_____	_____

TIME (MILITARY)	SCKEYE SMOLT (numbers)			OTHER (numbers)			COMMENTS 2/
	CATCH 1/	EXAMINED FOR MARKS	MARKED RECOVERIES	COHO	DOLLY V.	STICKLEB.	
TOTAL							

1/ Catch number does not include marked recoveries.

2/ To be included in comments: estimate young-of-year fry numbers by species and number of sockeye smolt mortalities.

counting the number of fish by species from a known aggregate weight obtained using a hanging scale. Generally the rule will be to sample every tenth dip net of fish for a species count by weight. The second method should only be used when there are relatively large number of smolt being caught, and there is not enough time to count all the fish without incurring mortalities. The daily smolt count data will be recorded on standard forms (Figures 1-2).

All catch will be identified and counted by species. Species identification keys are provided in Appendix A. It will be the responsibility of the crew leaders to insure that the crews use the keys to properly identify the catch.

Trap Efficiency

Once a week, trap efficiency will be estimated by marking sockeye smolt, releasing these smolt, and counting the number of recaptured smolt. Marking is accomplished by the use of Bismark Brown Y dye. The dyeing process can be stressful on sockeye smolt. This is important to keep in mind at all times during the procedure. Minimizing unnecessary stress is the key in the dyeing process. Excessive handling (netting), elevated water temperature, and exposure to the dye, itself, are the primary stress factors. All of these can induce mortality alone, so if one or more of these are combined, significant mortality may occur. The following steps should be followed to minimize mortality and assure valid results:

1. **Collect 500 to 525 sockeye smolt.** The goal is to be consistent in the weekly timing and number of our marking and release. Do not hold smolt for more than three nights when

SCKEYE SALMON SMOLT SUMMARY FORM

PROJECT LOCATION :

[illegible]

2/ Numbers of fish caught does not include marked recoveries.

trying to collect the 500 for marking. Mark what you have collected after three days. A minimum of 250 smolt should be used if an extended collection time is required.

2. **Set up dyeing station at release site.** Release site will be no less than 0.5 miles upstream of smolt trap in an area of relatively calm water. A holding box will be placed in the stream, preferably in a "pool" area, for initial release of marked smolt. Assemble other marking equipment: a 30 gallon garbage can, Bismark Brown Y dye, supplemental oxygen (O2 bottle, regulator, tubing, air stone), aerators, thermometer, log book.
3. **Move smolt to release site.** Use 3 buckets and 3 floating net bags to hold the smolt. The net bags fit inside the buckets. An aerator will be used to aerate the water in each bucket. Split the 500 smolt between the three buckets. It is important to be efficient when moving the smolt to the release site. Record the water temperature prior to transport to the release site.
4. **Dye and release smolt.** Hold the smolt at the release site in the net bags in the stream holding box while the dye is being mixed. Record the water temperature in the holding box. If there is significantly higher temperature, supplement water with oxygen. Do not remove the smolt from the net bags. Use 1 gram of BBY dye per 30 liters (8 gallons) of water. Mix water (15 gallons) and dye (1.9g) in 30 gallon can. Use an aerator and supplemental oxygen to maintain oxygen level in container. Record water temperature in container. Place net bags of smolt into dye/water mixture for 30 minutes. Record the water temperature in the container and any mortality that occurs. Remove the net bags

with the smolt and place in recovery holding box for one hour. After the recovery period, remove and document any mortality or weak appearing smolt. Transfer the remaining smolt from the net bags into water filled buckets and release them evenly across the stream. Record the final number of healthy smolt release, time of release, water temperatures and other data on the Smolt Dye Release Form (Figure 3).

5. **Examine for marked smolt.** For three days following the release of dyed smolt daily smolt catch will be examined for marked fish. Trap efficiency is measured by the number of marked fish recovered. Record mark recapture data on the Daily Smolt Catch Reporting Form (Figure 1) and summarize the data on the Sockeye Salmon Smolt Summary Form (Figure 2). Remember that number of smolt examined in a day equals marked and non-marked smolt caught that day. Daily smolt catch will then equal number examined minus marked since marked smolt were previously counted.

Age, Weight, and Length Sampling

At each location 70 sockeye smolt per day, six days per week, are to be sampled for age, length, and weight. Specific procedures for collecting and recording the information is in Appendix B. Each sample will be taken from a single days catch. Do not mix samples between days. If less than 70 fish are caught in a day the sample size for that day will be the number of fish caught on that day. Since smolt primarily migrate at night a single sampling day will be the 24-h period from noon to noon and will be identified by the calendar date corresponding to the first noon.

Figure 3.

SMOLT DYE RELEASE FORM

DATE (actual): _____

CREW NAMES (print) _____

PROJECT LOCATION _____

NUMBER OF FISH COLLECTED: _____
(from live box)

CREW LEADER
(signature) _____

	COLLECTION LIVE BOX	TRANSPORT BUCKET	RECOVERY CONTAINER	DYE TUB	RECOVERY CONTAINER	TRANSPORT BUCKET	STREAM RELEASE
START TIME (military)							
START TEMP (degree celsius)							
END MORTALITY (number of fish)							
OXYGEN SUPPLEMENT O2 or aerator (A)							

DYE SOLUTION (mixture): _____ Dye (grams); _____ Water (gallons)

RELEASE SITE LOCATION (distance upstream of trap site, in miles) _____

TOTAL NUMBER OF DYED FISH RELEASED: _____

COMMENTS:

Otolith Collection

At Red Lake, 300 smolt will be taken for otolith analysis. As possible these smolt are to be collected proportional to outmigrating abundance. Ninety percent ethanol is to be used for preservative. The procedure for collection is straight forward. Simply take a fish (randomly) that has been captured in the trap, sample it for standard AWL data, and then put it into a individual polybottle filled with 90% ethanol. Take care to accurately label the bottle with the following information: the origin of capture, date, AWL sheet #, and fish reference #. Additionally, include the same information on a piece of write-in-the-rain paper and place it in the bottle with the fish. The percentage of preservative to fish is critical. Each bottle should be filled to the top with straight 90% ethanol.

Red Lake Smolt Weir

A full weir will be set-up and operated from approximately 1-30 June across the outlet of Red Lake at a site about 50 meters downstream of the smolt index traps. The weir will be fitted with a Canadian fan trap to pass smolt. The trap will be attended at all times between the hours of sunset and sunrise. All fish captured in the trap will be individually counted by species and released each time the trap is checked which again, will be nearly continuously at night.

The live box with the trap consists of two separate and independent compartments. The purpose of the compartments is to provide an emergency relief should the trap be inundated with more fish than the crew can process without causing mortality. As with the index traps, the first relief

from counting every smolt will be to switch to the catch-weight sampling procedure. If the crew still can not keep up with the smolt, the crew will open one live box compartment thereby letting 50% of the trap catch pass through the trap without being counted or weigh by the catch-weight procedure. When this is done the crew will process the other live box compartment to determine catch numbers by species and for a basis to estimate the number of smolt passing through the open compartment. Importantly when a compartment is open, the duration of the by-pass will be recorded and the counts from the other compartment be recorded separately from the regular counts when both compartments are operated as a unit. Again, this is essential for estimating the number of fish by species which pass uncaptured through the open compartment.

The data forms and further discription of the Red Lake smolt weir are in Appendix C and D.

Red Lake Fry Sampling

Weekly sample four field selected shoal areas using a 50-ft length beach seine. At each location, the catch will be sorted and counted by species and lengths will be taken by species. Data will be recorded on the Seine Catch Log Form (Figure 4). Once site selection is made, each seine site will be marked by a metal fence post stake to identify the location. Site locations will also be marked on the map identified in Figure 5.

Figure 4. Seine Catch Log Form.

Lake: _____ Time: _____ Remarks: _____

Date: _____ H2O temp: _____

Location: _____

Seine length: _____ Crew: _____

Total Catch

Sockeye _____ Coho _____ Dolly V. _____ Stickle. _____ Rainbow _____ Other _____

Length Sample

	Sockeye	Coho	Dolly V.	Stickleback	Rainbow
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
20					
21					
22					
23					
24					
25					

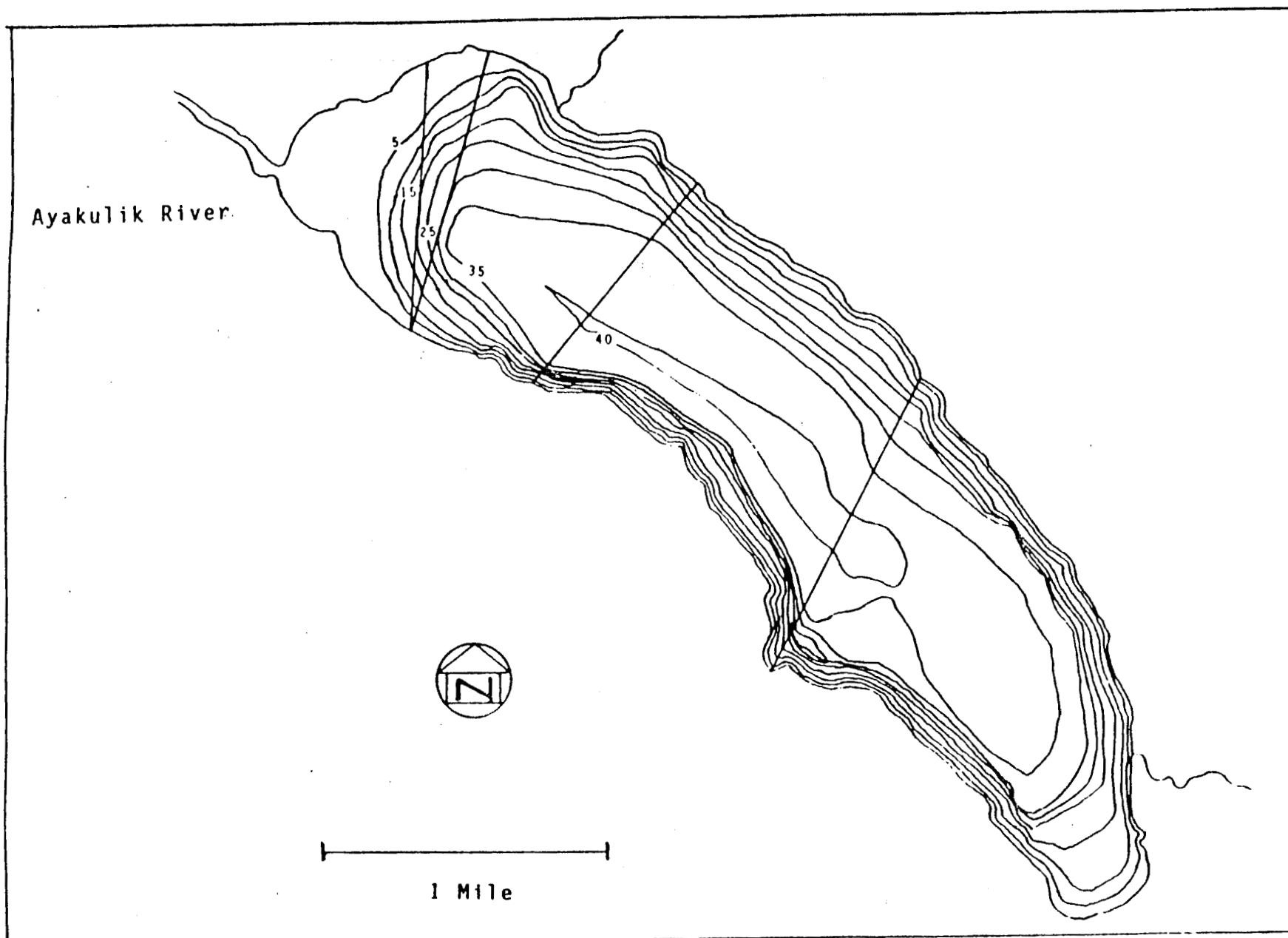


Figure 5 . Morphometric map of Red Lake on Kodiak Island.

Climate Data

Climatological data will be collected at each location daily at approximately 1800 hrs. The information will be recorded on the form in Figure 6 and will include water and air temperatures, stream height, percent cloud cover, and wind direction and velocity.

PROJECT TERMINATION

The smolt traps will be removed at the end of the smolt migration which is expected to be about 21 June. The exception is at Upper Station where smolt monitoring will continue through about 30 July to ensure that the age 0 smolt migration is evaluated. The exact date for removal of traps will be determined by Barrett and/or Swanton and will be based on trap catch rate performance.

APPENDIX A

Presmolt Salmon Key

and

Anadromous Juvenile Salmonides Key

NOAA Technical Memorandum NMFS ABFL-2

A Guide to the Collection and Identification of Presmolt Pacific Salmon in Alaska with an Illustrated Key

MILTON B. TRAUTMAN



SEATTLE, WA

NOVEMBER 1973

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

ACE10041778

A Guide to the Collection and Identification of Presmolt Pacific Salmon in Alaska with an Illustrated Key

MILTON B. TRAUTMAN¹

ABSTRACT

This field and laboratory key contains recommendations for types of equipment needed, instructions for preserving and labeling specimens, and descriptions of the characters used in identifying five species of Pacific salmon. The key is illustrated with six line figures: 1) juvenile salmon, 2) the first gill arch, 3) head with gill arch in situ, 4) first gill arch and eye for comparison with longest rakers, 5) method of counting anal fin rays, and 6) ventral surface of head showing branchiostegals. Five plates of stippled line drawings of five lengths (25 to 110 mm fork length) for each of the five species of Pacific salmon, an annotated opposable key, and a glossary are also included.

INTRODUCTION

As adults, the five species² of Pacific salmon of the genus *Oncorhynchus* inhabiting western North American waters are easily identified, but as subadults or as smolts in silvery coloration, they are less easily recognized. As juveniles less than 125 mm (5 inches) in fork length (FL), they may be quite difficult to identify. In addition, characters by which presmolt juveniles can be distinguished may vary with geographic area.

Several keys for identification of juvenile salmon have been published, most of which utilize the number, length, and shape of the gill rakers on the first gill arch; number of pyloric caeca and branchiostegals; and absence of parr marks, or if present, their size and shape (Foerster and Pritchard, 1935; Schultz, 1936; Haig-Brown, 1947; Clemens and Wilby, 1961; McPhail and Lindsey, 1970; Wilimovsky³). In addition to

the above characters, the key in this paper emphasizes and illustrates the distribution of those chromatophores (usually melanophores) which are reliable enough to aid in the specific identification of juveniles.

This key describes the characters typical of presmolt juveniles of the five species of Pacific salmon in Alaska. The common names recommended by the American Fisheries Society (Bailey et al., 1970, p. 17) are used, despite the fact that other names appear to be in more general use. These other names are inserted in parentheses after their respective species. Trouts, Atlantic salmon (*Salmo salar*), and some other salmonoids are included in the key because of their resemblance to Pacific salmon.

Before presenting the key, it appears advisable to describe the equipment and methods I recommend for preserving specimens, labeling specimens, and counting, measuring, and removing parts of specimens, so that those not acquainted with my procedures may more accurately and quickly identify their material.

¹ Professor Emeritus of Zoology, Ohio State University, Columbus, OH 43210. The author was employed in Alaska by the National Marine Fisheries Service Auke Bay Fisheries Laboratory during the summers of 1959 and 1961. The specimens were obtained and most of the drawings made at that time.

² A sixth species, *O. masou* (Brevoort), inhabits the streams of eastern Asia from the Okhotsk Sea to Formosa.

³ N. J. Wilimovsky, 1958. Provisional keys to the fishes of Alaska. On file Natl. Mar. Fish. Serv. Auke Bay Fish. Lab., Auke Bay, AK 99821.

Magnifiers: Magnification in the range of 4 to 30 will prove helpful in identification of juvenile salmon. A binocular microscope having such a range is the most satisfactory, but any type of magnifier of more than 4 power and less than 30 may be used provided it is not necessary to use one's hand to hold it—usually both hands are needed to manipulate a specimen. In the field, a binocular unit containing lenses inserted in a frame or headstrap or a jeweler's eye magnifier (especially if one wears glasses) may be used.

Forceps: Four or five inches long with straight or curved tips—for lifting fins, holding back gill covers, etc.

Scalpel: A sharp blade an inch or two long—for removing gill arches, opening body cavities, etc.

Teasing needle: A needle inserted in a wooden or metal handle—for separating closely set gill rakers, etc.

Dividers: For measuring and comparing various body parts; dividers in which one or both legs can be "broken" are the most satisfactory.

Scissors: About 6 inches long with the blades or cutting surface of about 1 inch.

Ruler: Graduated in millimeters to measure fish lengths and parts; one which includes inches also desirable.

PRESERVING SPECIMENS

The careful preserving of specimens cannot be too strongly emphasized. Much time is lost in attempting to identify improperly preserved fishes; it is only when properly preserved that they may be rapidly and correctly identified. Frequently, juvenile salmon that have died in nets become soft, bleached, and torn. For the sake of accuracy it is better not to attempt to identify such material.

To preserve juveniles, upon capture place them in a solution of 1 part Formalin to 9 parts water. If live fishes are placed in too strong a Formalin solution, they may die with their mouths widely agape or the chromatophores may close so tightly as to be difficult to detect. If placed in too weak a Formalin solution, the fishes become bleached and soft and may decompose. If fishes are to be preserved for more than a year (or permanently),

and if possible, when removed from the Formalin solution, soak them in water for 24 to 48 hr; then place them in a solution containing 70% ethyl alcohol and 30% water or 35% isopropyl alcohol and 65% water.

Do not crowd or pack fishes in a container, especially if they are alive or only recently dead. Fresh fishes, if packed too tightly, will become permanently deformed upon hardening in Formalin, will be bleached where their bodies come in close contact, or will decompose. A container is too crowded if the fishes will not readily move as the container is slowly rotated or shaken. When sufficient room is allowed, identification will be facilitated because the fishes will harden without discoloring; bodies and fins will not be deformed, twisted, or broken; and the chromatophores will remain nearly or fully open.

LABELING SPECIMENS

Labeling specimens fully and properly is of great importance; unlabeled or mislabeled specimens are of little or no value. Put the label with the specimens at the time the fishes are preserved. Label paper should remain firm when wet and should not become pulpy. Write clearly with pencil or permanent ink, recording the following data.

Field Number

Use your own or a department number. A satisfactory method is to use the first initial of your surname or your full surname, the last two digits of the year, and your collection number. Thus, if Joe Brown in 1962 preserves his fifth collection, he writes B-62-5 or Brown-62-5; if for the Department of Salmon Investigations he writes, SI-62-5. When a departmental symbol is used, it often is desirable for the collector to add his initials or name to the label.

Name of Water Body and Locality

Use names on standard maps. Whenever possible, avoid temporary or local names, such as

adequate recording is: Alaska, Naknek River System, Katmai National Monument, Brooks Lake.

Date

Include the month, day, and year and, if pertinent, the hour.

The following additional information may be needed at times.

Method of Capture

Describe type of gear and size if significant, i.e., seine (2 cm mesh), fry net (1 cm mesh), trawl (1 cm bag), etc.

Temperature

Measure temperature of air and/or water. If water is ice-covered, what percent?

Other Water Conditions

If a *stream*: estimate its average width and maximum depth; if tidal and brackish, to what

silt, plankton, etc.; degree of gradient—low, moderate, or high; percentage of stream in pools, with or without current; percentage of stream in riffles, whether flow is sluggish, moderate, or swift; dominant bottom types—sand, gravel, boulders, bedrock, muck, silt, etc.; aquatic vegetation—submerged, emergent, or both (name dominant species or genera if known). If a *lake* or *bay*: state whether fresh, brackish, or saline; if tidal, state to what extent; estimate size and possible depth; give degree of turbidity, type of bottom, and amount and kinds of aquatic vegetation.

Remarks

Describe anything that may aid in identification of the fishes, such as peculiar markings, habits, or habitats.

CHARACTERS USED IN IDENTIFYING SPECIES

A juvenile salmon is shown in Figure 1 to assist in recognizing and defining the characters and the counts and measurements used when keying out a specimen.

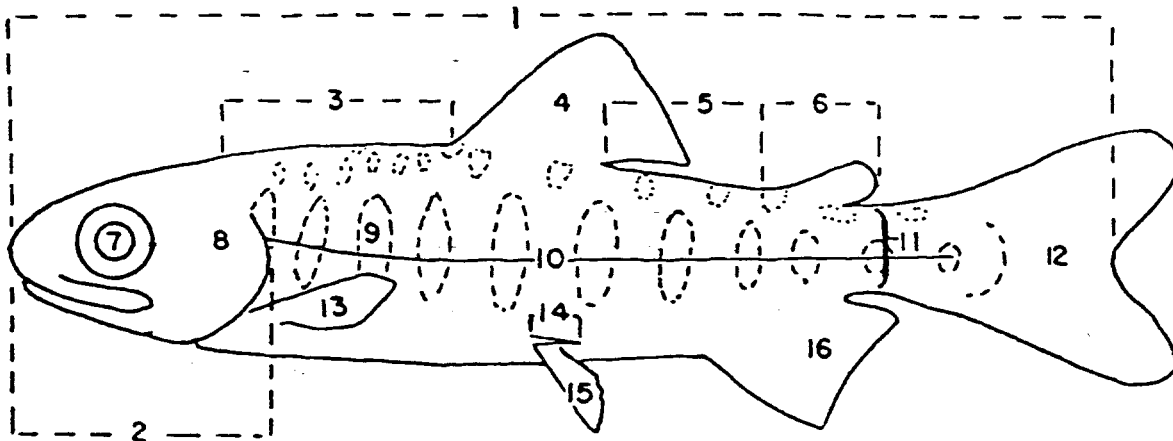
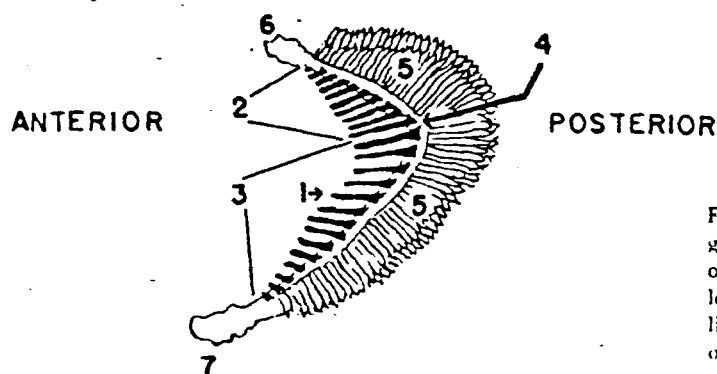


Figure 1.—Juvenile salmon, illustrating parts and methods of measuring: 1: fork length; 2: head length; 3: predorsal ridge; 4: dorsal fin; 5: portion of postdorsal ridge between posterior end of dorsal fin base and origin of adipose fin; 6: adipose fin; 7: pupil of eye; 8: gill cover, beneath which is gill chamber containing gill arches; 9: a parr mark; 10: lateral line; 11: caudal peduncle; 12: caudal fin or tail; 13: pectoral fin; 14: axillary process or scale; 15: pelvic fin; 16: anal fin.

Beneath each gill cover are four fully formed gill arches; the first gill arch on either side is the part used for specific identification. A gill arch (Fig. 2) consists primarily of a bony central arch to which the gill rakers are attached anteriorly, the gill filaments (lamellae) posteriorly. The gill rakers prevent solid substances such as food from being carried out through the branchial clefts and protect the delicate gill filaments. The numbers of gill rakers vary somewhat among individuals of each species of salmon, but the difference in average number between some species is sufficiently great to enable one to use them as specific characters.

The rakers on the gill arch may be counted as a unit, or the upper and lower limbs may be counted separately. The two limbs are joined



dorsal ends of the first and second arches, making a deep incision parallel with them; then cut the remainder of the attachment away. Next cut the ventral attachment in the same manner; and when both ends are free, remove the arch. Great care must be taken so that all rudimentary rakers may be removed and counted. After finishing the examination of the arch, reinsert it in the gill chamber for possible future examination.

Gill Raker and Eye Comparison

The longest rakers are compared with the length of the eye (Fig. 4). With dividers, obtain the measurement of the length of the longest raker; then place one point of the dividers at the anterior edge of the eye, the other extending

Figure 2. — First gill arch of salmon after removal from left gill chamber: 1) gill raker; 2) gill rakers attached to upper or shorter limb of arch; 3) gill rakers attached to lower or longer limb of arch; 4) angle of arch (junction of the two limbs or bones); 5) gill filaments (lamellae); 6) upper point of arch attachment; 7) lower point of arch attachment.

at an angle, the upper being the shorter. When a raker is situated astride the angle, it is included in the lower limb count. When all of the rakers on the arch are counted as a unit, a single number is given; otherwise, both limbs are recorded separately (the upper limb first), and then added, thus $12 + 20 = 32$.

The gill rakers nearest the angle of the arch are the longest; the rakers become progressively shorter as they approach the attachment ends of each arch. The rakers near the ends are often rudimentary and can be counted only under magnification.

It may be difficult to count all of the rakers accurately while the first gill arch is in place, in which case it will be necessary to remove the arch. To do this, turn back or cut away gill cover as shown in Figure 3. Lift the first gill arch up-

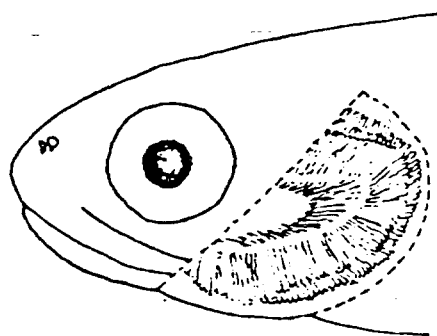
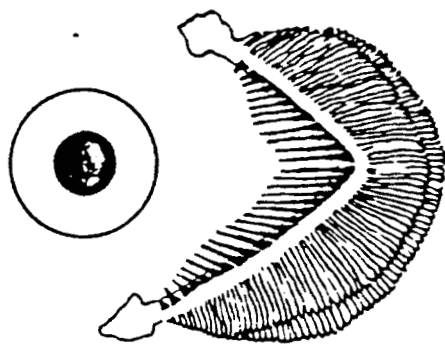
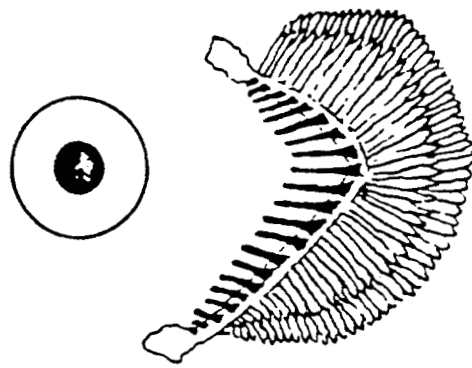


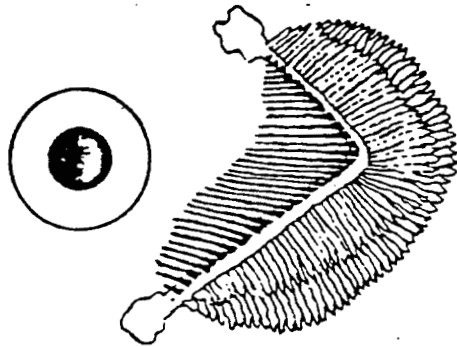
Figure 3. — Head of salmon. Dotted lines indicate that portion of gill cover which has been removed to show first gill arch in place.



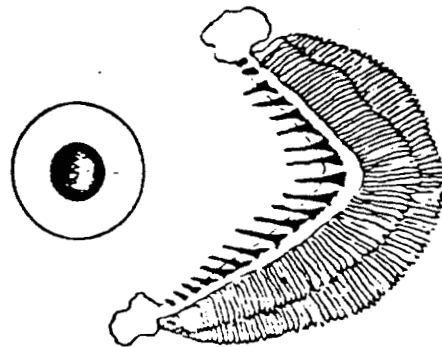
PINK



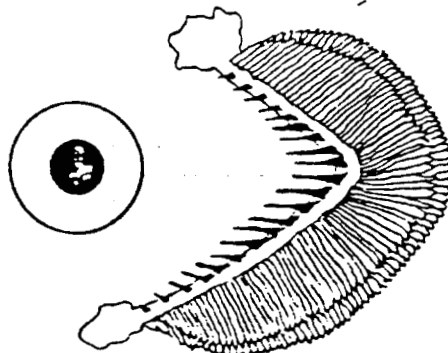
CHUM



SOCKEYE



CHINOOK



COHO

Figure 4. - First gill arch and eye for comparison with longest gill raker length of five species of Pacific salmon.

toward the opposite edge. Because the raker is shorter than the eye length in juvenile salmon, it is simplest to note where the raker reaches in relation to the pupil. Like many body part ratios, the gill raker-eye size ratios change as the juvenile salmon increases in length. For example, in specimens about 40 mm FL, the longest raker may be contained about 3 times the eye length, but in 140 mm specimens of the same species, the raker may be contained only about 2 times. This and other proportional changes must be considered.

Anal Fin Measurement and Count

To compare the length of the fin base with the longest ray, measure the anal fin-base with dividers; then project the posterior leg of the dividers forward to the opposite tip of the longest ray as shown in Figure 5 by dotted line.

In counting the number of rays (Fig. 5), do not count those anteriormost ones which are less than half the length of the longest rays, such as those marked "0." Count all rays, such as No. 1, that are half (or more than half) the length of the longest ray, taking great care to observe the last ray—No. 15 in Figure 5. The last ray is usually split to its base and appears superficially as two rays, but it is in reality only one and should be counted as such.

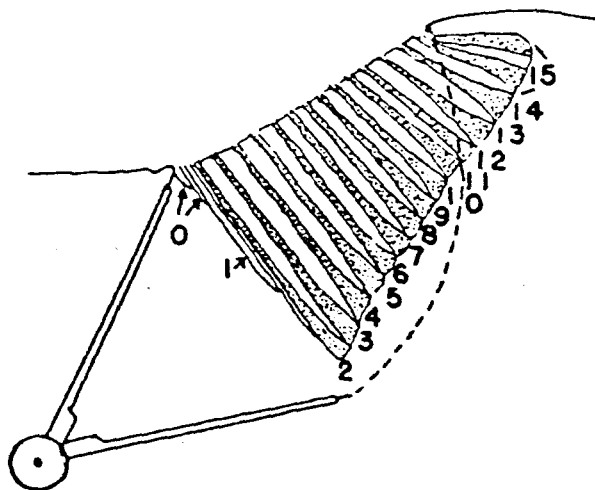


Figure 5. — Anal fin of salmon, illustrating method of measuring length of fin base and of counting rays (rays 2 to 15 are stippled here for emphasis).

All branchiostegals (Fig. 6), including the smallest, anteriormost ones are counted. Usually this may be accomplished satisfactorily only under magnification and with juveniles longer than 40 mm FL. The branchiostegal count is used primarily as an additional character in specimens otherwise difficult to identify, and is especially valuable in separating the chinook salmon (usually 15 or 16) from the coho salmon (usually 13 or 14).

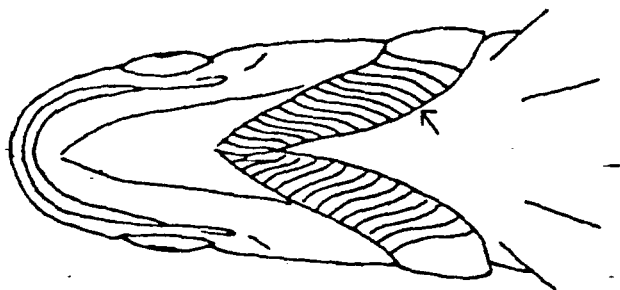


Figure 6. — Ventral surface of head of salmon. Arrow points to one of 14 branchiostegals on left side of head.

Pyloric Caeca Count⁴

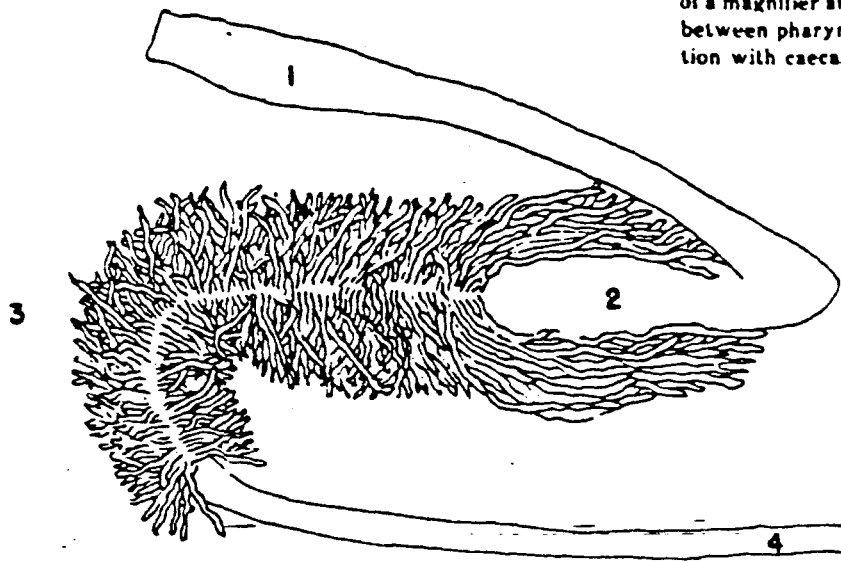
With a scalpel, widely open the abdominal cavity. Sever the esophagus as far forward as possible; then cut off the intestine near the posterior end of the stomach. The stomach and caeca can now be removed as a unit (Fig. 7). Use magnification and teasing needle as aids in counting. Counts of pyloric caeca are useful chiefly as an additional character for questionable specimens, especially in separating the chinook salmon (more than 100 caeca) from the coho salmon (fewer than 90).

Color Pattern Variations

Juvenile salmon from certain waters or at certain stages of development may have their parr marks or other markings masked by a bluish-

⁴In the key, I have used pyloric caeca counts of my own, plus published accounts of others and especially the more recent ones, such as Clemens and Wilby (1961) and McPhail and Lindsey (1970).

of a magnifier and teasing needle: 1) esophagus (part of tract between pharynx and stomach), 2) stomach, 3) pyloric section with caeca, 4) intestine.



or greenish-silvery sheen, especially when they are alive. To identify these fish, it may be necessary to preserve them first in Formalin to intensify their markings.

Juveniles of one species from certain waters, such as habitually turbid ones, may have their melanophores restricted in size or distribution, thereby resembling superficially another species. As an example, coho salmon normally have the adipose and anal fins densely speckled with rather large melanophores. But in some specimens, the melanophores may be reduced in size or distribution, so that coho salmon superficially resemble chinook salmon. Conversely, juvenile chinook salmon may have the melanophores unusually numerous and well developed, thereby resembling coho salmon. To avoid error in identification, compare the size and number of melanophores on the fins with those on the body; if few and small on the body, they should be few and small on the fins.

Color variations also occur regionally. An example is the predorsal stripe in chinook salmon, which in fish from some waters is normally a solid dark bar in specimens less than 80 mm FL; in chinook salmon in other waters the stripe may be reduced to a series of oblong blotches.

The length when individuals attain smolt coloration varies greatly, both regionally and in specimens from the same locality; some fish of

the same species may lose parr and other presmolt markings when only half as large as other fish.

HOW TO USE KEY

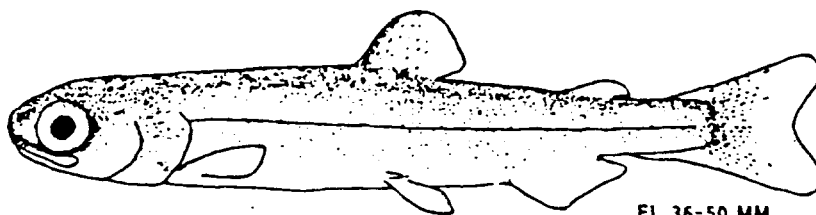
Because of the variations in morphology and coloring, it is advisable to use the key in conjunction with the figures and plates and to check a large combination of characters.

In using the key, first make certain your specimen is a Pacific salmon by examining the characters under the two opposable groups labeled "1." Next, note the absence or presence of parr marks (see sections "Combination of" under opposable groups 2). If no parr marks are present and your specimen has not entered the silvery smolt stage, it is probably a pink salmon, but to make sure, compare it with the identifying characters between opposable groups 2. If parr marks are present, note the absence or presence of melanophores on adipose and anal fins (see groups 3). If melanophores are absent, see sections "Combination of" under groups 4; if present, see "Combination of" sections under groups 5. Decide which "Combination of" most closely fits your specimen, then verify it by comparing the descriptions of the identifying characters for the opposable groups.

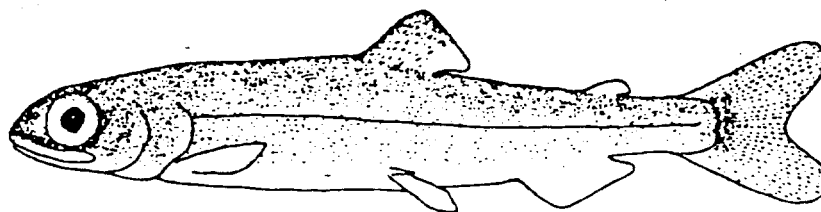
- Salmonoid fishes having fewer than 20 rays in the dorsal fin (excludes grayling); strong teeth on jaws and tongue (excludes ciscoes and whitefishes); many pyloric caeca (excludes smelts, family Osmeridae); an axillary process or scaly appendage above pelvic fin (Fig. 1, No. 14); an adipose fin; cycloid scales; upper jaw formed by both premaxillary and maxillary1.
- 1a Base of anal fin *shorter* than longest ray (Fig. 5). Anal rays usually 9 to 12 (rarely 8 or 13). Gill rakers normally fewer than 20 on first gill arch (Fig. 3). Dorsal fin of larger juveniles of some species with several blackish spots.
CHAR. TROUTS, ATLANTIC SALMON.Not in this key.
- 1b Base of anal fin *longer* than longest ray (Fig. 5). Anal rays usually 13 to 17 (rarely 12, 18, or 19). Gill rakers normally 20 to 40 on first gill arch (rarely 19). Dorsal fin of larger juveniles lack blackish spots but tip of fin may be blackish.
PACIFIC SALMON—genus *Oncorhynchus*.2.
- 2a *Combination of: No parr marks on sides and no prominent specklings on back of presmolt juveniles. Usually no melanophores on anal and adipose fins; if melanophores present, they are few and very small, and if on adipose, are restricted to its posterior, free edge.*
PINK (HUMPBACK) SALMON—*O. gorbuscha*.Plate 1.
- General development—Similar to chum salmon in that yolk sac may not disappear until juvenile is more than 34 mm FL, after which development toward smolt shape and coloration is rapid. When less than 50 mm FL, this species is similar to chum salmon in being more terete than the sockeye, chinook, and coho salmon; body depth immediately before dorsal fin usually more than 1.5 times head length.
- Parr marks—Only species of salmon lacking parr marks in the presmolt juvenile.
- Coloration of body—*Preserved material*—In juveniles less than 40 mm FL, back is dark to lateral line and ventral half of body light when bicolored; dorsal third of body is darkest, sides lighter, ventral third lightest (usually milky-white or silvery) when tricolored. Few or no melanophores on lower sides and belly. In juveniles more than 40 mm FL, bicolored or tricolored condition is normally not evident, the dark back lightening gradually downward to the very light belly. *Living specimens*—Dorsal half of body bright bluish or greenish with much silvery reflection; ventral half milky or silvery-white.
- Fins—Anal and dorsal fins averaging smaller than in chum salmon; these fins in this species and in chum salmon distinctly smaller than in sockeye, chinook, or coho salmon. In specimens less than 40 mm FL the longest anal ray, when measured into head length, extends from tip of snout to about center of eye; in larger presmolt juveniles, this measurement extends from tip of snout to anterior half of eye. Anal rays usually 14 to 16 (extremes 13 to 17). *Dorsal fin* has few specklings and only a slight tendency toward a dark anterior edge in juveniles less than 50 mm FL; over 50 mm, blackish anterior edge becomes pronounced and tip of fin dusky. *Caudal fin* has speckling confined to basal half in juveniles less than 50 mm; with increasing length of juveniles, specklings appear along rays, and in large presmolt juveniles lobes tend to become blackish.



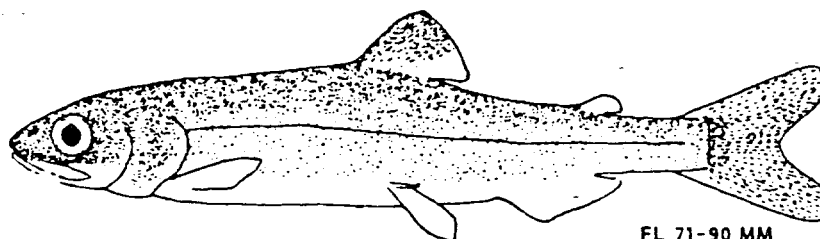
FL 25-35 MM



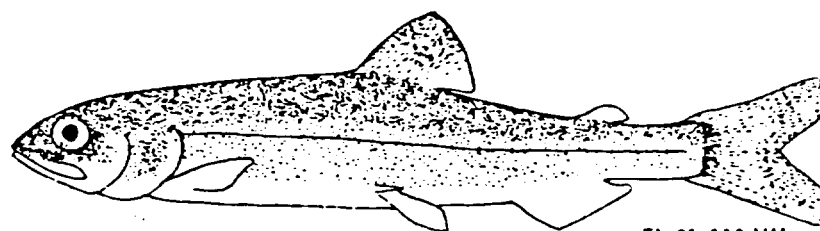
FL 36-50 MM



FL 51-70 MM



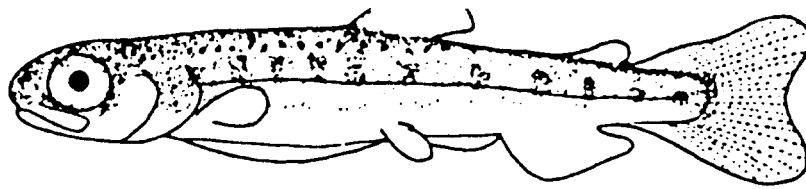
FL 71-90 MM



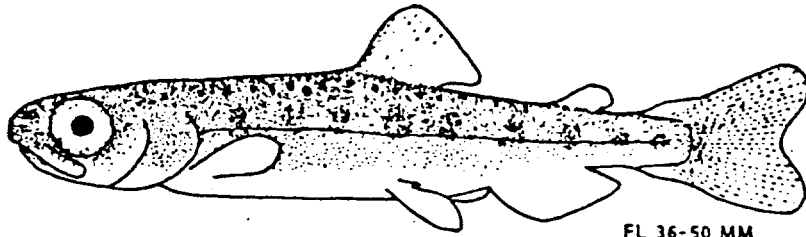
FL 91-110 MM

Plate 1.—Pink salmon.

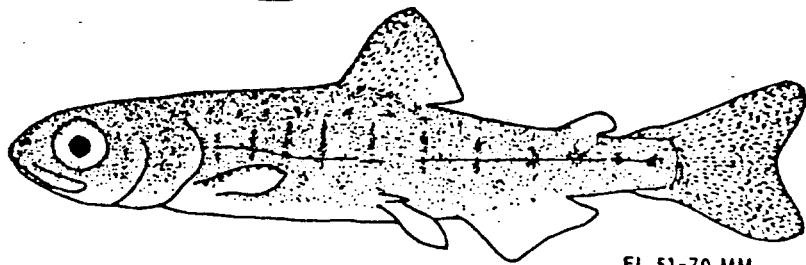
- Gill rakers (see fig. 1) — Eleven to fourteen on upper mandible; usually ranging between 27 and 33 (extremes 25 and 35); rakers slender and rather long; most similar in size and number to sockeye salmon but shorter and usually fewer (normally less than 31).
- Pyloric caeca — Usually 130 to 195 (extremes 95 to 224); slender and rather long; differ sufficiently in numbers from coho and sockeye salmon, which have fewer than 100, to be a distinct aid in specific identification.
- Branchiostegal rays — Usually 11 to 14 (rarely 10 or 15); average number less than in other species, almost invariably less than in chinook salmon, which usually has 15 to 18 (rarely 14).
- Scales in lateral line — More than 170, more than in any other of the Pacific salmon; lateral line scale counts may be obtained under magnification in specimens longer than 60 mm FL.
- Habits — Shortest life span of any species, between 18 mo and 2 yr. Only a comparatively small proportion of adults make extended migration in fresh water. Majority spawn in fresh waters within a short distance of brackish water or in intertidal waters. Many young enter brackish or salt waters within a few hours or days after emerging from redds, and comparatively few are found in fresh water when more than 45 mm FL.
- Combination of:** Both parr marks on sides and dark spottings on back usually obvious in living, presmolt juveniles and always in preserved specimens under magnification (may be faint in fishes from turbid waters); parr marks become faint and disappear as juvenile assumes smolt coloration3.
- 2b
- No melanophores normally present on adipose and anal fins of presmolt juveniles, or if present, few and quite small. Parr marks occupy a larger area above lateral line than below it, and in some specimens anterior parr marks may be almost entirely above the lateral line.
- 3a
- CHUM AND SOCKEYE SALMON4.
- Melanophores normally obvious on adipose fin in living specimens and always in preserved specimens under magnification (may be indistinct in juveniles from silty waters). Anteriormost parr marks appear to occupy as large (or almost as large) an area below lateral line as above it; these parr marks are usually large, long, and wide.
- 3b
- CHINOOK AND COHO SALMON5.
- Combination of:** Gill rakers 19 to 26 (average 23), notably fewer and much shorter than in sockeye salmon, which have more than 28. Normally no melanophores on adipose and anal fins. Anterior squarish (quadrate) parr marks situated almost or entirely above lateral line in specimens less than 50 mm FL; in presmolt juveniles more than 50 mm FL, anterior parr marks tend to be long and very narrow and sometimes may extend well below lateral line.
- 4a
- CHUM (DOG) SALMON — *O. keta*Plate 2.
- General development — Similar to pink salmon in that yolk sac may not disappear until juvenile is more than 34 mm FL, after which development toward smolt shape is rapid. Also similar to pink salmon in being more terete (when less than 50 mm FL) than the sockeye, chinook, and coho salmon; body depth immediately before dorsal fin usually 1.5 to 1.8 times head length.



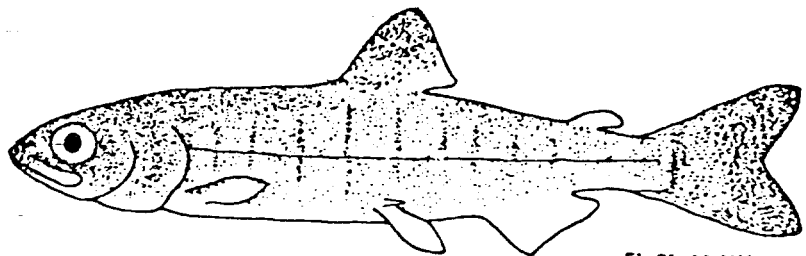
FL 25-35 MM



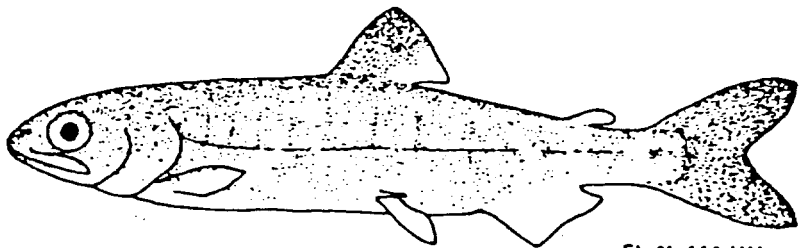
FL 36-50 MM



FL 51-70 MM



FL 71-90 MM



FL 91-110 MM

Plate 2. — Chum salmon.

Parr marks—Anterior parr marks in specimens less than 50 mm FL are squarish (quadrate) and do not extend quite so far below lateral line as in sockeye salmon; in presmolt juveniles more than 50 mm FL, parr marks tend to become longer and more narrow than in sockeye salmon, and some tend to extend well below lateral line.

Coloration of body—*Preserved material*—Dorsal ridge stripe usually present, sometimes a series of blotches in juveniles less than 50 mm FL, becoming faint or disappearing in presmolt juveniles more than 50 mm FL; a prominent irregular row of spots and blotchings between dorsal ridge and upper edge of parr marks, these usually most distinct in specimens between 34 and 50 mm, often fading or disappearing in larger juveniles. *Living specimens*—Markings may be obscured by greenish or bluish overcast of dorsal half of body and whitish or silverish sheen of ventral half.

Fins—Anal and dorsal fins small, averaging slightly larger in size than those of pink salmon and averaging considerably smaller in height and area than those of sockeye salmon. Length of longest anal ray, when measured from snout to eye, reaches to, or almost to, center of eye; in sockeye salmon this measurement usually extends well beyond center of eye. Anal rays usually 13 or 14 (extremes 13 to 17). *Dorsal fin* has few or no distinct spottings in specimens less than 50 mm FL; in larger presmolt juveniles a dusky spot develops on tip. *Caudal fin* has faint spots largely confined to basal half in juveniles less than 50 mm FL; in larger juveniles lobes become blackish.

Gill rakers (see Fig. 4)—Seven to twelve on upper limb, 12 to 19 on lower, total usually ranging between 20 and 26 (extremes 19 to 30); rakers blunt and short, in sharp contrast to thinner, longer, and more numerous rakers of sockeye salmon, which has 30 to 39.

Pyloric caeca—Usually 160 to 185 (extremes 140 to 249); differ sufficiently in numbers from sockeye and coho salmon, which usually have fewer than 100, to be an aid in specific identification.

Branchiostegal rays—Usually 13 or 14 (extremes 12 to 16); of value primarily in separating this species from chinook salmon, which generally has more than 15.

Scales in lateral line—Between 125 and 155; of value chiefly in separating this species from pink salmon.

Habits—Life span usually 3 to 5 yr, for majority, 4 yr, some less than 3 yr. Jacks may occur. Majority spawn in fresh waters only a comparatively short distance from brackish water or in intertidal waters. Many young enter brackish or salt waters very shortly after emerging from redd, and few juveniles are found in fresh waters when more than 45 mm FL.

Combination of: Gill rakers 30 to 39 (average 36); notably more numerous, longer, and more slender than in chum salmon, which have fewer than 27. Normally no melanophores on adipose and anal fins. Anterior parr marks more rectangular than squarish in outline in specimens less than 45 mm FL and sometimes extend as much as a third to a half below lateral line; these oblong parr marks tend to shorten in presmolt juveniles more than 50 mm FL and to be mostly above lateral line.

4b

SOCKEYE (RED) SALMON—*O. nerka*. Plate 3.

General development—Yolk sac usually disappears, except for trace, before juveniles reach 30 mm FL. Body deeper and species more slab-sided in all presmolt lengths than in chum and pink salmon—body depth immediately before dorsal fin usually less than 1.5 times head length.

Parr marks—See "Combination of" above.

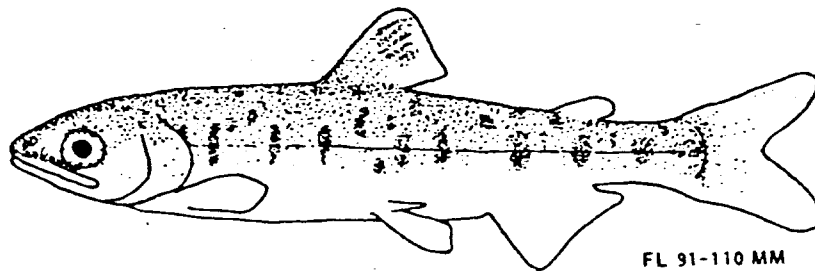
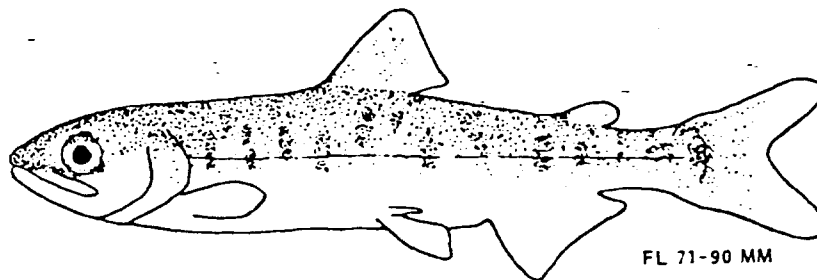
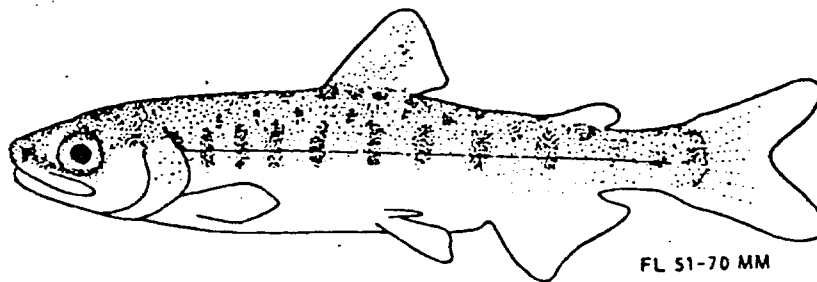
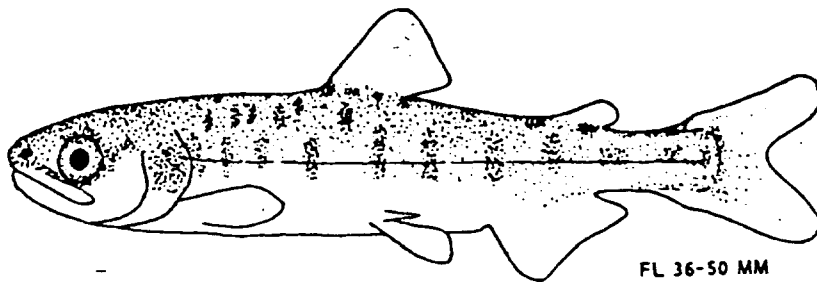
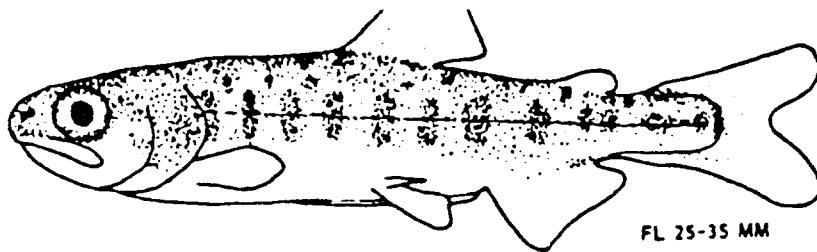


Plate 3. — Sockeye salmon.

of more or less distinct spots in specimens less than 35 mm FL, becoming more confluent in fishes between 40 and 55 mm FL and sometimes merging into a dusky bar; in presmolt juveniles over 60 mm FL, spots or bars may disappear, after which a series of roundish spots become apparent on both sides of, and adjacent to, dorsal ridge, especially that portion behind dorsal fin; in addition to these spots, in fishes more than 35 mm FL, another longitudinal row of spots develops between dorsal ridge and upper halves of parr marks. *Living specimens*—Markings may be obscured by greenish or bluish overcast of dorsal half of body and whitish or silverish sheen of ventral half.

Fins—Anal and dorsal fins average larger in height and area than in chum and pink salmon. Length of longest anal ray, when measured from snout to eye, reaches usually from snout to beyond center of eye. Anal rays usually 14 to 16 (extremes 13 to 16). *Dorsal fin* normally has few or no distinct specklings in specimens less than 60 mm FL; a rather faint dorsal spot develops in larger presmolt juveniles in upper portion of fin, the fin being bordered on its free edges with whitish (see lowest figure, Plate 3). *Caudal fin* has few specklings on basal half, the lobes having few or no melanophores, even in rather large juveniles.

Gill rakers (see Fig. 4)—Twelve to sixteen on upper limb, 18 to 23 on lower, total usually ranging between 32 and 37 (extremes 30 to 39); rakers long and slender, averaging longer than in any other species, in sharp contrast to fewer, blunter rakers of chum salmon, which has 19 to 30.

Pyloric caeca—Usually 65 to 95 (extremes 45 to 115); usually considerably fewer than in pink, chum, and chinook salmon, and averaging more than in coho salmon.

Branchiostegal rays—Usually 13 to 15 (extremes 11 to 16); of value chiefly in separating this species from chinook salmon, which average more.

Scales in lateral line—Between 125 and 140; of value chiefly in separating this species from pink salmon, which has a higher number.

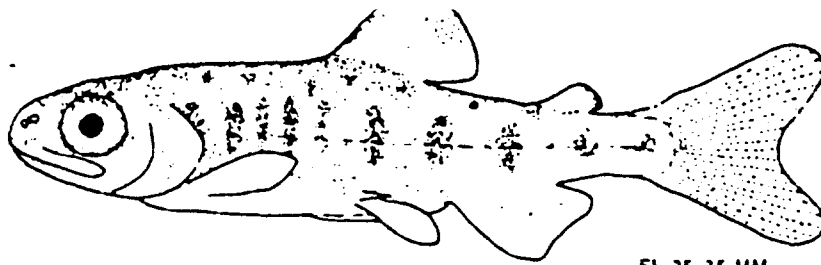
Habits—Life span usually 4 or 5 yr, some only 3. Jacks may occur. Majority of individuals highly migratory. Adults usually spawn in streams tributary to lakes; a small minority spawn in streams without a lake, in lake outlets, or on lake beaches. After rising from redd, young move downstream rather rapidly to a lake, remaining usually 1, sometimes 2, and rarely 3 yr in fresh water before entering brackish or salt water.

5a *Combination of:* Melanophores on adipose fin usually most numerous on posterior half and generally forming a dark border (see Plate 4); anterior half of adipose with few melanophores or none. Anal fin with few melanophores or none, but when melanophores are present, often quite large. Tip of dorsal fin and lobes of caudal fin darker in larger presmolt juveniles.

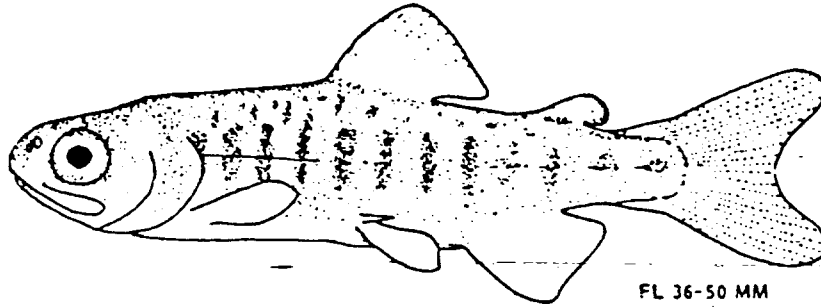
CHINOOK (KING) SALMON—*O. tshawytscha*.Plate 4.

General development—Yolk sac usually disappears or is reduced to a trace before juveniles reach 32 mm FL. Body deeper and species more slab-sided in all presmolt lengths than in chum and pink salmon; body depth immediately before dorsal fin usually less than 1.5 times head length (range 1.1 to 1.5).

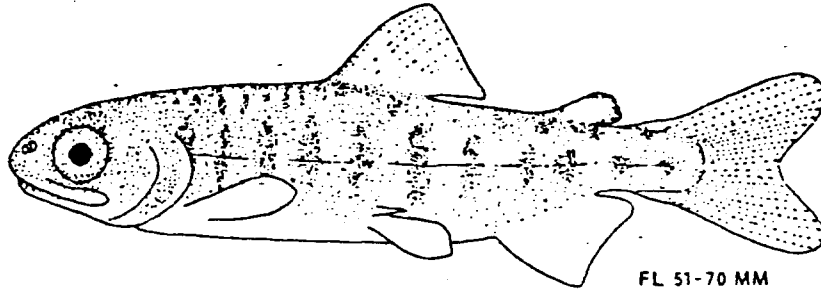
Parr marks—Almost invariably rectangular and long vertically; marks usually situated equidistant on each side of lateral line; dark parr marks and other markings contrast sharply with lighter background of body in some living and most preserved specimens.



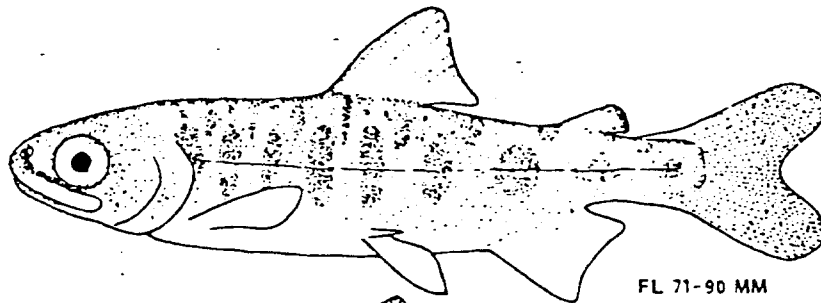
FL 25-35 MM



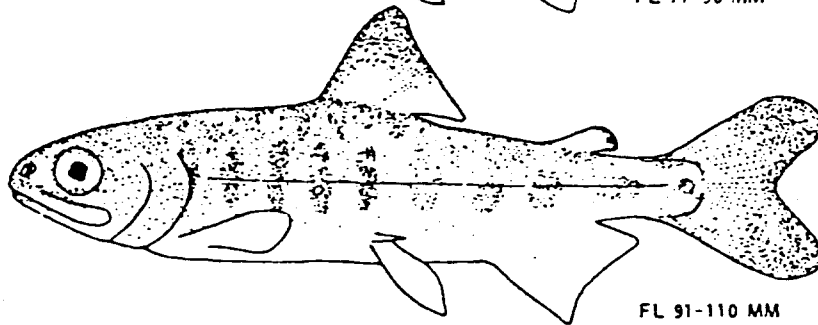
FL 36-50 MM



FL 51-70 MM



FL 71-90 MM



FL 91-110 MM

Plate 4. — Chinook salmon.

Coloration of body—*Pseudoclu maculatus*—Background color of body generally much lighter than body color of coho salmon, usually contrasting sharply with dark dorsal stripe or spotting, parr marks, and prominent dorsal spottings; blackish band astride dorsal ridge usually bold and unbroken in specimens less than 80 mm FL and especially on ridge before dorsal fin; in larger juveniles dorsal band often breaks up into series of spots, disappearing in larger pre-smolts as other spottings on dorsal half of body become more numerous and distinct; spottings between dorsal ridge and parr marks absent in fishes less than 35 mm FL, developing rapidly thereafter into many large and small spots and increasing in numbers as juveniles approach smolt stage. *Living specimens*—Parr marks and other markings may be obscured by bluish-silvery color of dorsal half of body and silvery sheen of ventral half.

Fins—Anal and dorsal fins averaging considerably larger in area than those of the chum and pink salmon and slightly larger than in the sockeye salmon; length of longest anal rays, when measured into head length, reaching from snout tip to beyond posterior edge of pupil and sometimes beyond posterior edge of eye; distal edge of anal slightly falcate in specimens more than 40 mm FL but averaging less falcate than does the free edge of the anal of the coho salmon. Anal rays 15 to 19, averaging higher in number than in any other species. *Dorsal fin* in young less than 60 mm FL usually has few or no distinct spottings; a blackish spot developing in the upper portion of the fin as the juveniles approach the smolt stage (see Plate 4). *Caudal fin* has comparatively few melanophores rather generally distributed in the smaller individuals, the lobes darkening as the fishes approach the presmolt stage.

Gill rakers (see Fig. 4)—Seven to twelve on upper limb, 10 to 16 on lower, total usually ranging between 20 and 25 (extremes 19 to 28); rakers short and similar in size and number to chum and coho salmon.

Pyloric caeca—Usually 140 to 185 (extremes 90 to 240); of value in separating this species from coho salmon, which normally has fewer than 85.

Branchiostegal rays—Usually 16 to 18 (extremes 13 to 19); average number greater than in any other species.

Scales in lateral line—Between 132 and 152; usually of most value in separating this species from pink salmon.

Habits—Life span 2 to 8 yr, usually 4 to 6. Jacks may occur. A portion of the juveniles enter salt water during first year of life; remainder stay in fresh waters more than 1 yr but rarely 2 yr. Juveniles of presmolt stage found in fresh waters when as long as 150 mm FL.

Combination of: Melanophores usually numerous and rather evenly distributed on adipose fin; occasionally in larger juveniles, posterior or free edge may be darker than remainder, thereby resembling somewhat melanophore distribution on adipose of chinook salmon. Anal fin in specimens larger than 30 mm FL more falcate and anterior tip more pronounced than in other species, including chinook salmon; in all except smallest specimens, anterior or leading edge of anal fin is whitish, with a dark bar parallel and posterior to it; remaining, posterior portion of fin usually abundantly speckled with melanophores except for distal and posterior edges (see Plate 5).

COHO (SILVER) SALMON—*O. kisutch*. Plate 5.

General development—Yolk sac usually disappears, except for a trace, before juveniles reach 32 mm FL. Body deeper and species more slab-sided in all pre-

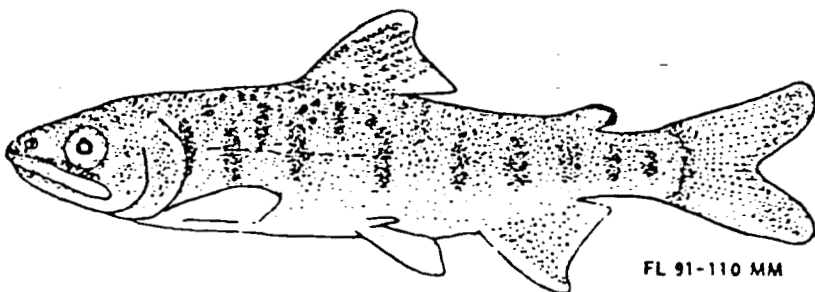
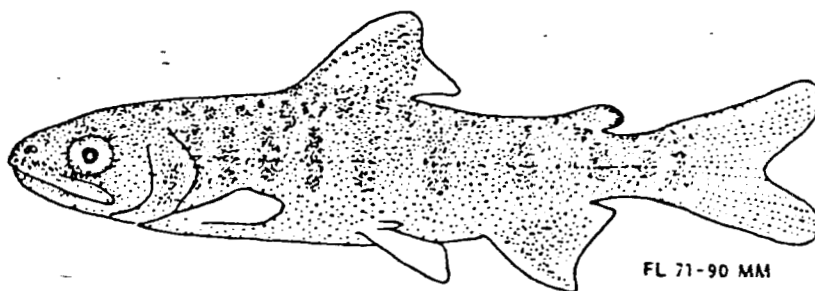
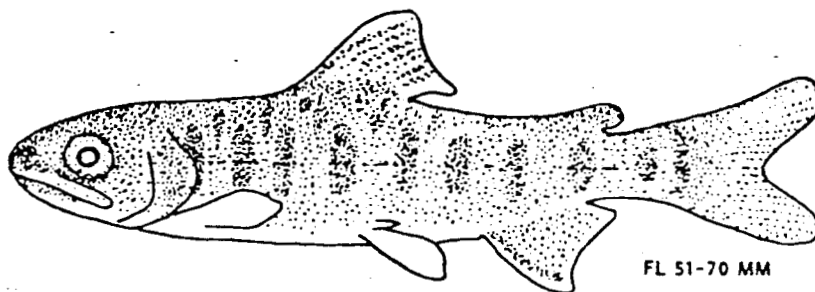
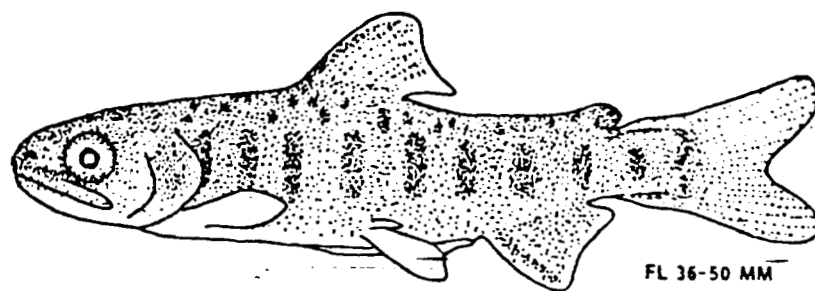
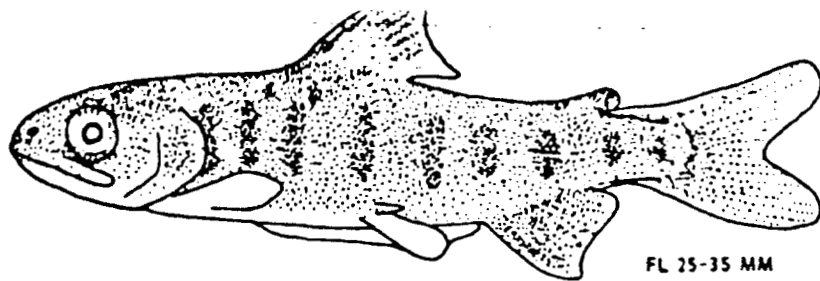


Plate 5. — Coho salmon.

smolt lengths than in chum and pink salmon; body depth dorsal fin usually less than 1.5 times head length (range 0.9 to 1.5).

Parr marks—Anterior parr marks always large and long vertically, their upper and lower ends more rounded than rectangular-shaped parr marks of chinook salmon; marks usually situated equidistant on each side of lateral line; usually less contrast between color of parr marks and body than in chinook salmon.

Coloration of body—*Preserved material*—In all but smallest specimens, contrast between all body marks and background color of body is not as pronounced as in other species; dark bar along dorsal ridge usually distinct and unbroken in juveniles less than 50 mm FL, breaking up into spots or disappearing in larger specimens; back spottings on both sides of dorsal ridge usually prominent in all except smallest specimens; spots between parr marks often elongate and extending downward between them, sometimes to lateral line (see bottom figure, Plate 5); spots on dorsal half of body often increase in number and/or decrease in size as individuals approach smolt stage. *Living specimens*—Parr marks and other body markings may be obscured by dark coloration of body or by bluish sheen.

Fins—Anal and adipose fins described under "Combination of" (this section). Anal rays usually 13 or 14 (extremes 13 to 16). Dorsal fin has comparatively few melanophores scattered over it in smallest specimens; in those more than 32 mm FL the number of melanophores increases, especially on or adjacent to anterior or leading edge; this results in a dark bar along the anterior edge behind which melanophores are rather evenly distributed; as fishes approach presmolt stage, a white anterior (or leading) edge and a whitish tip develops, followed by a dark parallel bar (see bottom figure, Plate 5). Caudal fin has rather even distribution of melanophores along rays in all except smallest young, this increasing in color intensity and number as fish increases in size.

Gill rakers (see Fig. 4)—Eight to thirteen on upper limb, 9 to 14 on lower, total number usually ranging between 19 and 27 (extremes 18 to 27); rakers short and rather similar in size and number to chum and chinook salmon.

Pyloric caeca—Usually 50 to 85 (extremes 45 to 114); of value in separating this species from chinook, pink, and chum salmon, which normally have more than 100.

Branchiostegal rays—Usually 13 or 14 (extremes 12 to 15); average number less than in chinook salmon, which normally has 15 or more.

Scales in lateral line—Between 120 and 140 (average 128); usually averaging fewer than in any other species.

Habits—Life span 2 to 4 yr. Jacks may occur. Majority appear to spend 1 or 2 yr in fresh waters, a few 3 yr. Some juveniles in presmolt stage are found in fresh waters when 150 mm FL.

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Key to Field Identification of Anadromous Juvenile Salmonids in the Pacific Northwest

ROBERT J. McCONNELL and GEORGE R. SNYDER

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January 1972

Key to Field Identification of Anadromous Juvenile Salmonids in the Pacific Northwest

By

ROBERT J. McCONNELL and GEORGE R. SNYDER

National Marine Fisheries Service
Northwest Fisheries Center
2725 Montlake Boulevard East
Seattle, Washington 98102

ABSTRACT

A key is presented with descriptive illustrations to help in field identification of live, juvenile salmonids in fresh waters of the Pacific Northwest. Other juvenile fish that may be mistakenly identified as salmonids are included.

INTRODUCTION

Species identification of live, anadromous juvenile salmonids is frequently a problem to the field biologist. The purpose of this key is to list and illustrate the external characteristics which will expedite field identification of juvenile salmonids in the Pacific Northwest.

Five species of Pacific salmon (pink, chum, sockeye, chinook, and coho); four species of trout (cutthroat, brown, Dolly Varden, and rainbow or steelhead); and other juvenile and adult fish that may be mistaken for salmon or trout in fresh water are described in this key.

USE OF KEY

The characteristics for identification are listed in a series of alternative statements, some of which are illustrated. To use the key, examine the first statement; if applicable, proceed to the next and continue to successive statements until the species is identified. If a statement is not applicable, pass to the alter-

native characteristics indicated by numbers in parentheses (numbers on the drawings correspond to numbers of statements in the key). Continue in this manner until the specimen is identified. Some external characteristics are positive separating features (marked with asterisk), whereas others are not. Therefore, two or more statements should be considered before final rejection. If a precise identification cannot be made using the external characteristics—and the fish can be sacrificed, a positive identification can usually be made from internal features (marked with double asterisks). A bibliography of keys that utilize more descriptive internal characteristics is included in this paper.

KEY

1. (47) Adipose fin and scales present.
(Fig. 1)
2. (48) Fleshy appendage at base of pelvic fins present.
3. (49) Mouth large, reaching at least to center of eye.

Family Salmonidae

¹ Especially adult smelt, family Osmeridae.

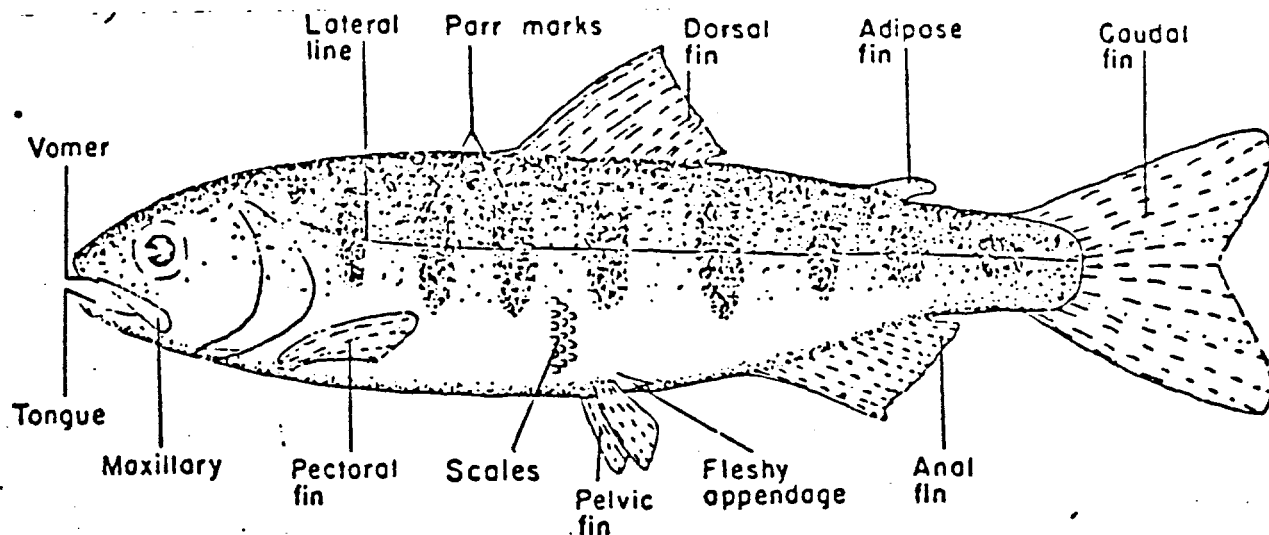


Figure 1.—A hypothetical salmonid showing external characteristics.

4. (17) Anal fin higher than long, with 8 to 12 developed rays (Fig. 2A)
5. (52) *Teeth on head and shaft of vomer. (Fig. 3A)

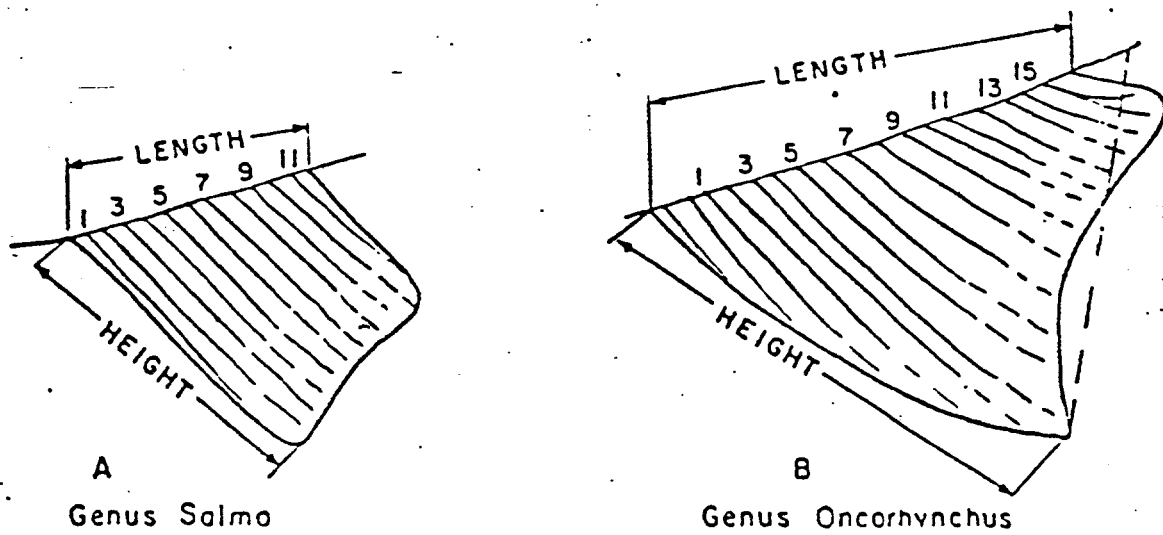
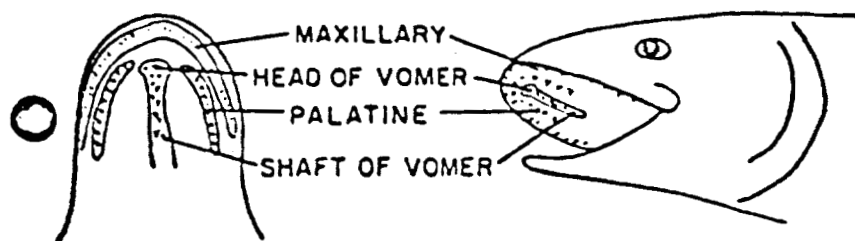
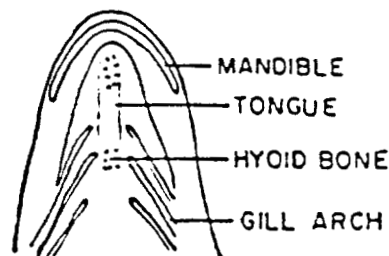


Figure 2.—Anal fins: (A) Trout, genus *Salmo*; (B) Pacific salmon, genus *Oncorhynchus*. The two drawings show differences in structure and fin ray count. (Note that the length of the anal fin is its overall basal length, and its height is that distance from the origin of the fin to the tip of the anterior lobe. In counting fin rays, include only those which originate from the base and terminate at the outer margin of the fin or are half as long as (or greater than) the longest ray.)



A



B

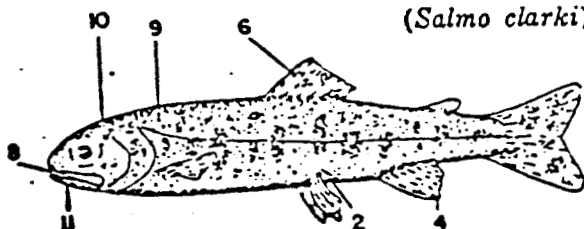
Figure 3.—Location of dentition in (A) the roof and (B) the floor of the mouth of salmonid fishes. (Presence or absence of teeth on the vomer or tongue may be determined by use of the little finger or a blunt instrument. The small hyoid teeth at the base of the tongue are located between the gill arches of the lower jaw and are difficult to find.)

6. (18) Dorsal fin with large dark spots.
Trout
Genus *Salmo*

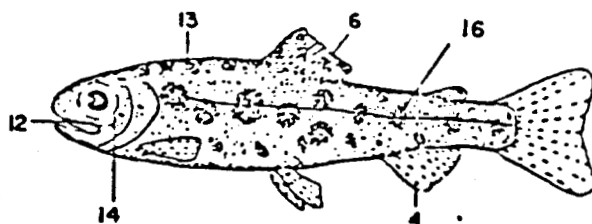
7. (53) Adipose fin not orange; no row of pale round spots along lateral line.
8. (12) *Small hyoid teeth at base of tongue. (Fig. 3B)

9. (13) Not more than five parr marks on mid-dorsal ahead of dorsal fin.
10. (14) Maxillary reaching past posterior margin of eye.

11. (15) Red or yellowish hyoid mark under lower jaw. Tail usually black spotted.
Cutthroat trout
(*Salmo clarki*)



16. (20) Parr marks almost round.
Rainbow or steelhead trout
(*Salmo gairdneri*)

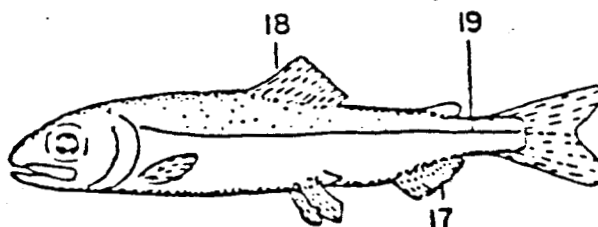


17. (4) Anal fin longer than high, with 13 or more developed rays. (Fig. 2B)
18. (6) Dorsal fin without large dark spots, may be black tipped.

Pacific salmon
Genus *Oncorhynchus*

19. (20) No parr marks. Fry leave fresh water while small—approximately 1.75 inches (45 mm) long.

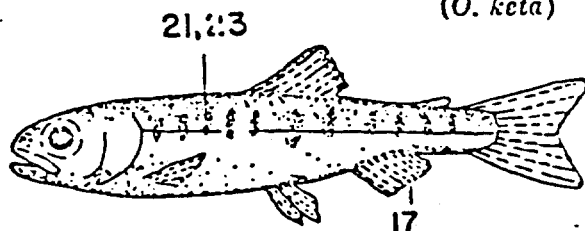
Pink salmon
(*O. gorbuscha*)



12. (8) *No teeth at base of tongue.
13. (9) Five to 10 parr marks along mid-dorsal ridge ahead of dorsal fin.
14. (10) Maxillary short, not reaching past posterior margin of eye.
15. (11) No hyoid mark under lower jaw. Few or no spots on tail.

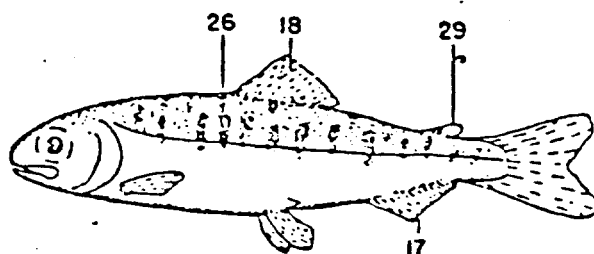
20. (16) Parr marks present as vertical bars or oval spots.
21. (30) Parr marks short, extending little, if any, below lateral line.
22. (25) Gill rakers on first arch, 19 to 26.
** Pyloric caeca, 140 to 186.
23. (26) Parr marks faint. Sides below lateral line iridescent green.
24. (27) Small when migrating from fresh water, approximately 1.5 inches (40 mm) long.

Chum salmon
(*O. keta*)



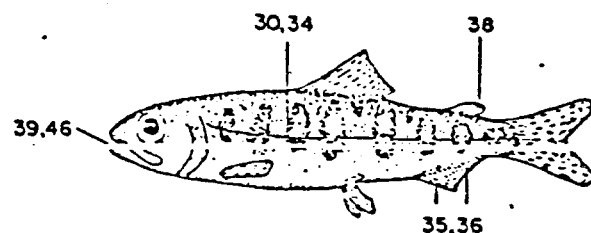
25. (22) Gill rakers on first arch, 30 to 40.
**Pyloric caeca 60 to 115.
26. (23) Parr marks usually sharply defined. Sides below lateral line silvery, not iridescent green.
27. (24) Relatively large when migrating from fresh water, approximately 3 to 5 inches (80 to 126 mm) long.
28. (31) Gill rakers long and slender, more than 29 on first arch.
29. (32) Adipose fin clear, not pigmented.

Sockeye salmon
(*O. nerka*)



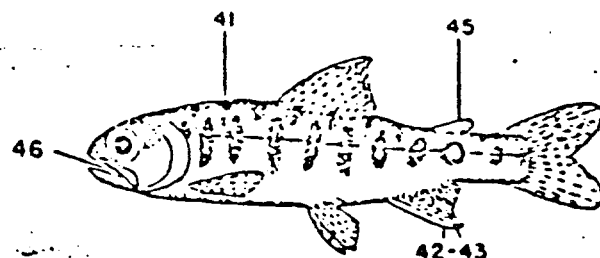
30. (21) Parr marks large, vertical bars centered by lateral line.
31. (28) **Gill rakers short and thick, fewer than 29 on first arch.
32. (29) Adipose fin at least partially pigmented.
33. (40) **Pyloric caeca more than 90.
34. (41) Parr marks broader than interspaces.
35. (42) Anterior rays of anal fin not distinctly longer than rest, not white edged.
36. (43) Anal fin not pigmented.
37. (44) Black spots, when present, on both lobes of caudal fin.
38. (45) Adipose fin not completely mottled, clear area at anterior base of fin.
39. (46) Black gums along base of lower teeth.

Chinook salmon
(*O. tshawytscha*)



40. (33) **Pyloric caeca less than 80.
41. (34) Parr marks narrower than interspaces.
42. (35) Anterior rays of anal fin elongated; when depressed they extend to base of last ray. (Fig. 2B)
43. (36) Anal fin pigmented between rays, resulting in black banding.
44. (37) Black spots, when present, on upper lobe of caudal.
45. (38) Adipose fin completely pigmented.
46. (36) Mouth gray to white.

Coho salmon
(*O. kisutch*)



47. (1) Adipose fin not present; scales present or lacking.

Not Salmonidae

48. (2) No fleshy appendage at base of pelvic fins.

Smelts

Family Osmeridae

49. (3) Mouth small, not reaching center of eye; teeth weak or absent.

50. (51) Depressed dorsal fin, shorter than head.

Whitefishes

Genus *Coregonus*

51. (50) Depressed dorsal fin, longer than head.

Arctic grayling

(*Thymallus arcticus*)

52. (5) **Teeth on head of vomer only.

Chars

Genus *Salvelinus*

Dolly Varden (*S. malma*)

53. (7) Adipose fin orange; row of distinct pale round spots along lateral line.

Brown trout

(*Salmo trutta*)

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We especially thank Dr. Arthur D. Welander, Professor of Fisheries, and Dr. Bruce S. Miller, Research Biologist, College of Fisheries, University of Washington, Seattle, for their valuable suggestions. We also thank Galen H. Maxfield, Fishery Biologist, and Dr. Alan J. Beardsley, Fishery Biologist, both from the NMFS Northwest Fisheries Center, Seattle.

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APPENDIX B

Procedures for Sampling Salmon Smolt

The sample size goal per week is 70 sockeye salmon smolt per day, six days a week. It is essential that the sample be taken randomly. In the event that more than the required sample size is in the smolt trap at the time of sampling the trap is to be stirred to assure randomness. When the smolt are randomly distributed a small dip net will be used to remove a subsample, this procedure will be repeated until the sample goal is met.

Smolt samples will be kept alive and worked the day of capture. MS222 will be used to anesthetize the fish. The use of this chemical will be demonstrated in the field. Age, weight, and length data will be recorded on AWL forms (Appendix B.1). Fill out AWL forms completely. Keep the litho codes in numerical order throughout the season and be sure to transfer the litho code to the backside of the AWL form.

A knife will be used to remove 5-10 scales from the preferred area, Appendix B.2. The scales will be mounted on a glass slide as illustrated in Appendix B.3. The left portion of each slide will be labeled with: location, date, AWL #, and fish numbers. Smolt lengths will be measured to the nearest millimeter, from the tip of the snout to the fork of the tail, Appendix B.4.

Excess water will be removed from the smolt before weighing by using a paper towel as a blotter. Individual smolt weights will be recorded to the nearest 0.1 gram on the backside (right side) of the AWL form (Appendix B.1).

DESCRIPTION: Upper Station
Sockeye Smolt
1992

Pitcher
Phillips

ADF&G ADULT SALMON AGE-LENGTH
FORM VERSION 2.1

DO NOT WRITE IN THIS MARGIN

234739

CARD:	001
SPECIES:	2
DAY:	11
MONTH:	05
YEAR:	92
DISTRICT:	257
SUBDISTRICT:	30
STREAM:	304
LOCATION:	UPPER STATION
PERIOD:	X
PROJECT:	4
GEAR:	00
MESH:	
TYPE OF LENGTH MEASUREMENT	1
NUMBER SCALES/ FISH	1
# OF CARDS	1

#	SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
1						
2						
3						
4						
5						
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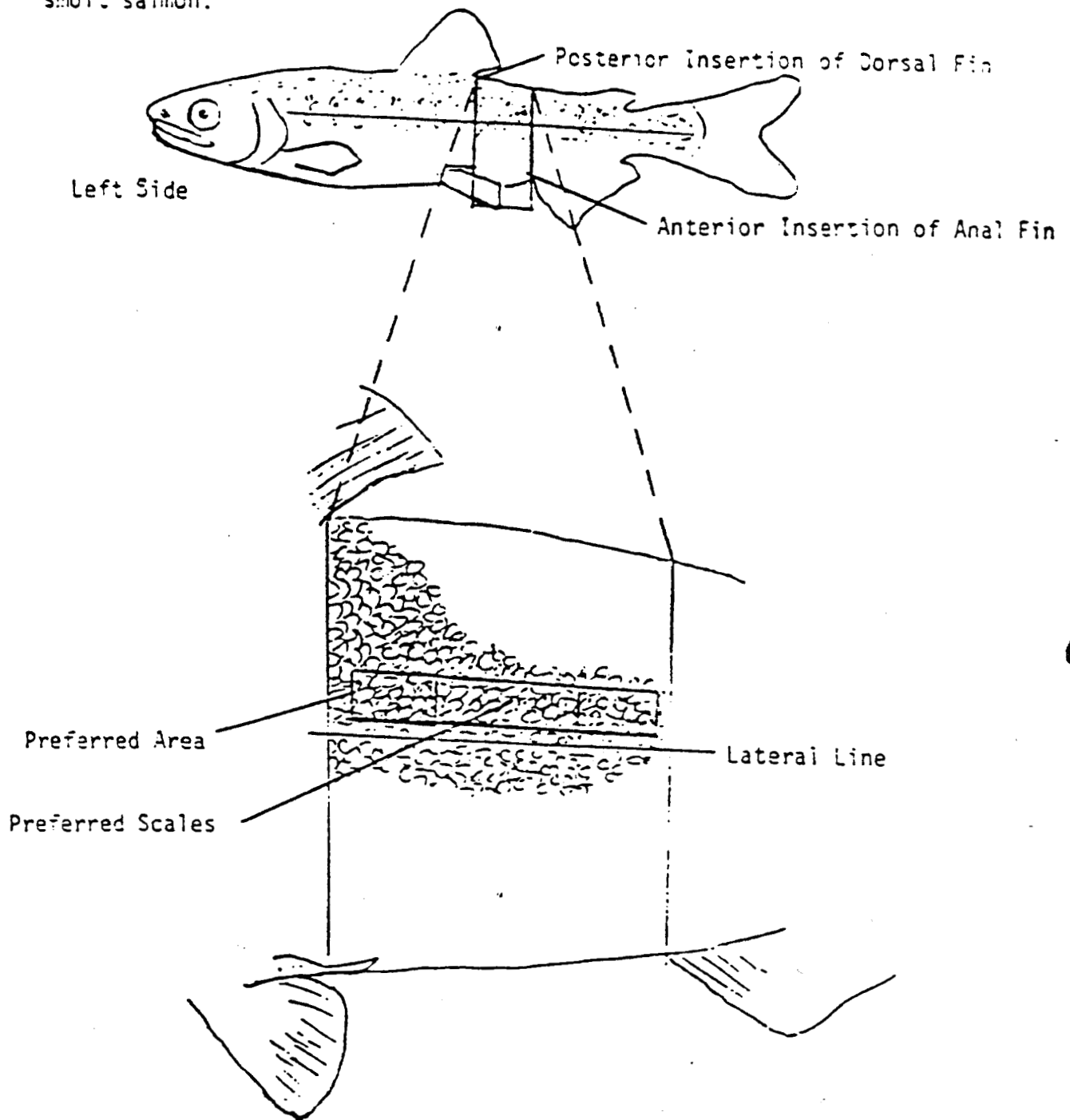
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TRANSFER RESPONSES
EXACTLY AS PRINTED
ON FRONT TO THIS GRID

#	Weights	10's	1's	1/10	SPECIES
1					1 - Chum (king)
2					2 - Sockeye (red)
3					3 - Coho (silver)
4					4 - Pink (humpy)
5					5 - Chum (dog)
6					
7					
8					
9					
10					
11					
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30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

- PROJECT**
- 1 - Commercial catch
 - 2 - Subsistence catch
 - 3 - Escapement (tower, weir, snare site, etc)
 - 4 - Escapement - spawning grounds
 - 5 - Test fishing
 - 6 - Sport catch (marine)
 - 7 - Sport catch (freshwater)
- GEAR TYPE**
- 8 - Trap
 - 9 - Purse seine
 - 10 - Beach seine
 - 11 - Handpocket
 - 12 - Drift gillnet
 - 13 - Dip net
 - 14 - Set gillnet
 - 15 - Beam trawl
 - 16 - Trawl
 - 17 - Long line
 - 18 - Shovel
 - 19 - Other trawl
 - 20 - Weir
 - 21 - Fish wheel
 - 22 - Pots
 - 23 - Sport hook and line
- LENGTH TYPE**
- 1 - Full snout to fork of tail
 - 2 - Mid eye to fork of tail
 - 3 - Post orbit to fork of tail
 - 4 - Mid eye to hypural plate
 - 5 - Post orbit to hypural plate
 - 6 - Unassigned
- AGE ERROR CODES**
- 1 - Otolith
 - 2 - Inverted
 - 3 - Aggregated
 - 4 - Unreadable
 - 5 - Missing
 - 6 - Reabsorbed
 - 7 - Wrong species
 - 8 - Not preferred

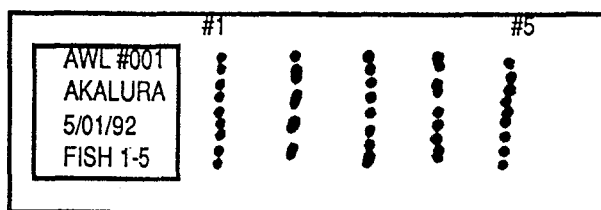
Appendix B.2. Scale sampling procedure showing the preferred scale sampling area on a smolt salmon.



Appendix B.3 Salmon smolt glass slide example.

The following information should be legibly written on the slide label:

1. AWL #
2. Location
3. date (mo/day/yr)
4. Fish # (1-5, 6-10, etc.)

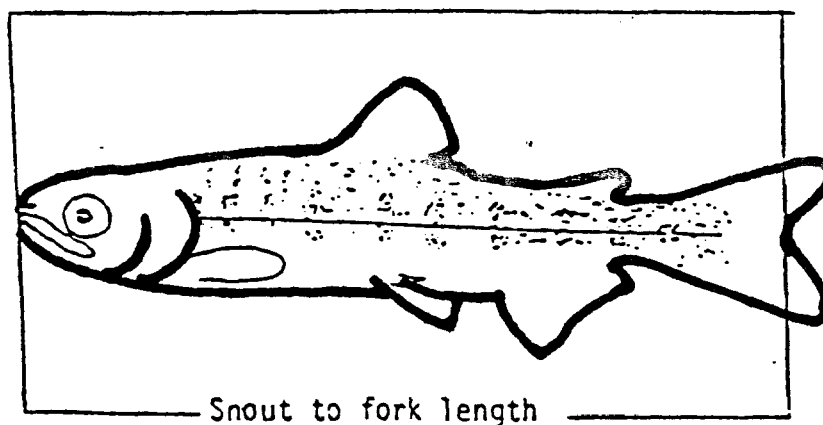


When the slides are completed, return them to the box in order by AWL #, date, and fish #.
Label the slide box on top with the following information:

LOCATION (AKALURA)
AWL NUMBERS (AWL # 001 - 010)
BEGINNING AND ENDING DATES (5/01 - 5/06/92)

Appendix B.4

Measuring Smolt Length



APPENDIX C
RED LAKE SMOLT WEIR

This is an amendment to the methods for the smolt weir project at Red Lake for 1992.

The purpose of the smolt weir is to provide an absolute count of the number of smolt by day for about 30 days. The results will be used to determine whether the smolt index trap estimates are biased.

A full smolt weir will be constructed about 50 meters downstream of the existing smolt index trap on the outlet stream of Red Lake. The weir will consist of a standard adult salmon aluminum picket weir faced with 1/2 inch grid black plastic netting on the upstream side of the aluminum pickets to block smolt passage. The weir will extend across the stream in a semi V-configuration from bank to bank. A four ft. wide Canadian fan trap equipped with a live box with two independent compartments will be inserted in approximately the center of the weir. All downstream migrant fish will be individually counted by species from the trap live box. The counts will be recorded on the Daily Smolt Weir Catch Reporting Form (Figure 1) and summarized on the Sockeye Salmon Smolt Weir Summary Form (Figure 2).

The trap will be checked nearly continuously daily from sunset to sunrise. Because of the expected high volume of smolt that will pass through the trap, it is not expected that the staff will have time to examine the catch for dyed marked smolt except during periods of low migration numbers. The staff will examine the catch for dye marked fish only when they are confident that every smolt caught during a three-day dye release period can be examined for the mark. Since the dyed smolt did not originate from the smolt weir operation they will be counted as catch unlike their treatment at the smolt index traps where they are recorded but not included as daily catch.

All fish caught in the trap's two live box compartments will be recorded as an aggregate catch on the Daily Smolt Weir Catch Reporting Form (Figure 1). Individual fish in the catch will be counted by species and released. There are some exceptions.

At times during the migration, the catch may exceed the counting capability of the staff. When this occurs, the staff will switch from individually counting fish to the catch-weight

DAILY SMOLT WEIR CATCH REPORTING FORM

DATE _____

TIME (MILITARY)	SOCKEYE SMOLT (numbers)			OTHER (numbers)			COMMENTS 2/
	CATCH 1/ FOR MARKS	EXAMINED FOR MARKS	MARKED RECOVERIES	COHO	DOLLY V.	STICKLEB.	
TOTAL							

2/ To be included in comments: estimate young-of-year fry numbers by species and number of sockeye smolt mortalities.

SOCKEYE SALMON SMOLT WEIR SUMMARY FORM

PROJECT LOCATION : _____

[illegible]

2/ Numbers of fish caught includes marked recoveries.

method of estimating catch numbers by species. The catch-weight procedure entails transferring the catch by dipnet to a wetted small mesh hanging basket suspended over the stream from a hanging scale. Each dipnet load of fish is weighed and recorded to the nearest 0.1 pound. Generally every tenth dipnet load weighed will be processed to determine number of fish by species. The data will be recorded on the Catch-Weight Sampling Forms (Figure 3). If there are still too many fish being caught to safely handle, the crew will randomly open one live box compartment thereby permitting free fish passage through that compartment. The crew will continue to process the catch in the other compartment following the catch-weight procedure. However, they will record that they are processing only the one compartment with the adjoining compartment open. It is essential that the crew make this notation because the resultant fish count numbers from the catch-weight procedure will be expanded to account for the number of fish that passed through the open compartment unprocessed. For accurate accounting, the crew will immediately switch to a new Catch-Weight Sampling Form (Figure 3) anytime they evoke the single live box compartment sampling procedure. Unless there is evidence of differential catch rate between trap compartments, the expansion factor for estimating the total catch by species when only a single live box compartment is processed will be 2.0. To determine if a rate difference exists, the crew will test for this during a field selected 48-hour period by keeping a separate catch log for each live box compartment. The 48-hour test period should occur when the trap is catching a relatively high number of smolt but not too high to require the catch-weight estimation procedure.

The smolt weir will be fitted with a gate to permit adult salmon passage and counting. Once the adult salmon migration begins, in early June, brown bear are heavily concentrated along the outlet stream feeding on salmon. It is important that escapement buildup behind the weir be minimized. Escapement count data by species are recorded on Weekly Salmon Weir Camp Report form (Figure 4).

Operation of the full smolt weir will be from about 27 May to 25 June 1992.

WORK SHEET FOR ESTIMATING SMOLT TRAP CATCH USING CATCH-WEIGHT SAMPLING

Figure 3.

Date: _____ Time Period (military): _____ to _____ Project Location: _____

Basket Weight (wet): _____

1.	11.	21.	31.
2.	12.	22.	32.
3.	13.	23.	33.
4.	14.	24.	34.
5.	15.	25.	35.
6.	16.	26.	36.
7.	17.	27.	37.
8.	18.	28.	38.
9.	19.	29.	39.
10.	20.	30.	40.

Totals: _____ + _____ + _____ + _____ = GRAND TOTAL

GRAND TOTAL LESS BASKET WEIGHTS (a): _____

	SAMPLE BIOMASS (Fish plus basket weight)	CATCH	
		Sockeye Smolt	Other
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
Sub-total	_____	_____ (c)	_____ (d)
TOTAL (less basket wts.)	_____ (b)		

ESTIMATED CATCH: _____ Smolt (ac/b); _____ Other (ad/b)

ALASKA DEPARTMENT OF FISH AND GAME
KODIAK MANAGEMENT AREA
WEEKLY SALMON WEIR CAMP REPORT FOR YEAR: _____

Figure 4.

WEIR CAMP										WEEKLY REPORT									
NAME: _____					PERSONNEL: _____					NO: _____					FOR WEEK ENDING (SATURDAY) _____				
DATE	DAILY TOTAL SALMON ESCAPEMENT					DAILY TOTALS	JACK NO.	REDS %	STEELHEAD		DOLLYS UP	GILLNET MARKED		H ₂ O LEVEL		H ₂ O TEMP.	WEATHER		
	KINGS	REDS	COHO	PINK	CHUMS				DOWN	UP		REDS	OTHER	UP	DN		CEIL.	VIS.	WIND DIR. / SPEED
SUN D																			
A																			
MON D																			
A																			
TUE D																			
A																			
WED D																			
A																			
THU D																			
A																			
FRI D																			
A																			
SAT D																			
A																			
TOTAL FOR WK _____																			
ACCUM. THRU WK _____																			
WEIR MORTS. FOR WK _____																			
TOT. ACCUM. _____																			
AWL SAMPL. FOR WK _____																			
TOT. ACCUM. _____																			
ADDITIONAL COMMENTS: (BEAR AND PEOPLE PROBLEMS: SMOLT MIGRATION: WEIR PROBLEMS: CABIN REPAIR: NOTE AIRCRAFT TRAFFIC)																			

APPENDIX D
RED LAKE SMOLT WEIR TRAP ASSEMBLY

First; The winch stand pipe is bolted to the "A" frames using 3/8 inch bolts and nuts, drop the bolts through from the inside. The bolts do not need to be tightened, which will allow the stands to twist for placement on an uneven bottom. The live-boxes are bolted together with three 5/16 bolts and nuts, using fender washers on each side.

Second; the divider slot slides along the bottom middle "V" of the trap bottom and snaps into the top frame member of the trap (Figure 1). Slide in at an angle with the bottom of the divider over the bolt, then bend the divider upright until the top groove locks into the groove in the trap frame.

Third; Bolt the chute hinge underneath the back bottom trap frame using 1/4 inch x 1 inch bolts with stainless steel washers and nylon lock nuts. The divider tail will fit between the middle chute sides. Tighten the wing nut on the chute to hold the chute up when placing the trap into the river.

Fourth; Place the winch stand over the trap and hook the carabineers to the eye bolts (or chain). Winch the trap up to see if the cables are even, if not let the cables all the way out and adjust the lengths by pulling the cable (if using eye-bolts). Do not let the back legs of the winch stand extend more than one foot past the back of the trap when placing in the river, or the live-boxes will not slide forward to lock in place.

Fifth; Slide the live-boxes over the chute and lock into place (flange on the bottom back side of the chute over the live-box frame). In the river it will be easier if the trap is winched up so that the live-boxes are out of the water when assembling. Also the perforated plates on the front of the live-boxes can be removed for assembly if needed. Snap the small chain on the front of the live-boxes to the trap eye-bolts (or chain) and adjust so that the live-boxes are not completely supported by the chute when in the water. The live-box chains can also be used to level the live-boxes by adjusting the length.

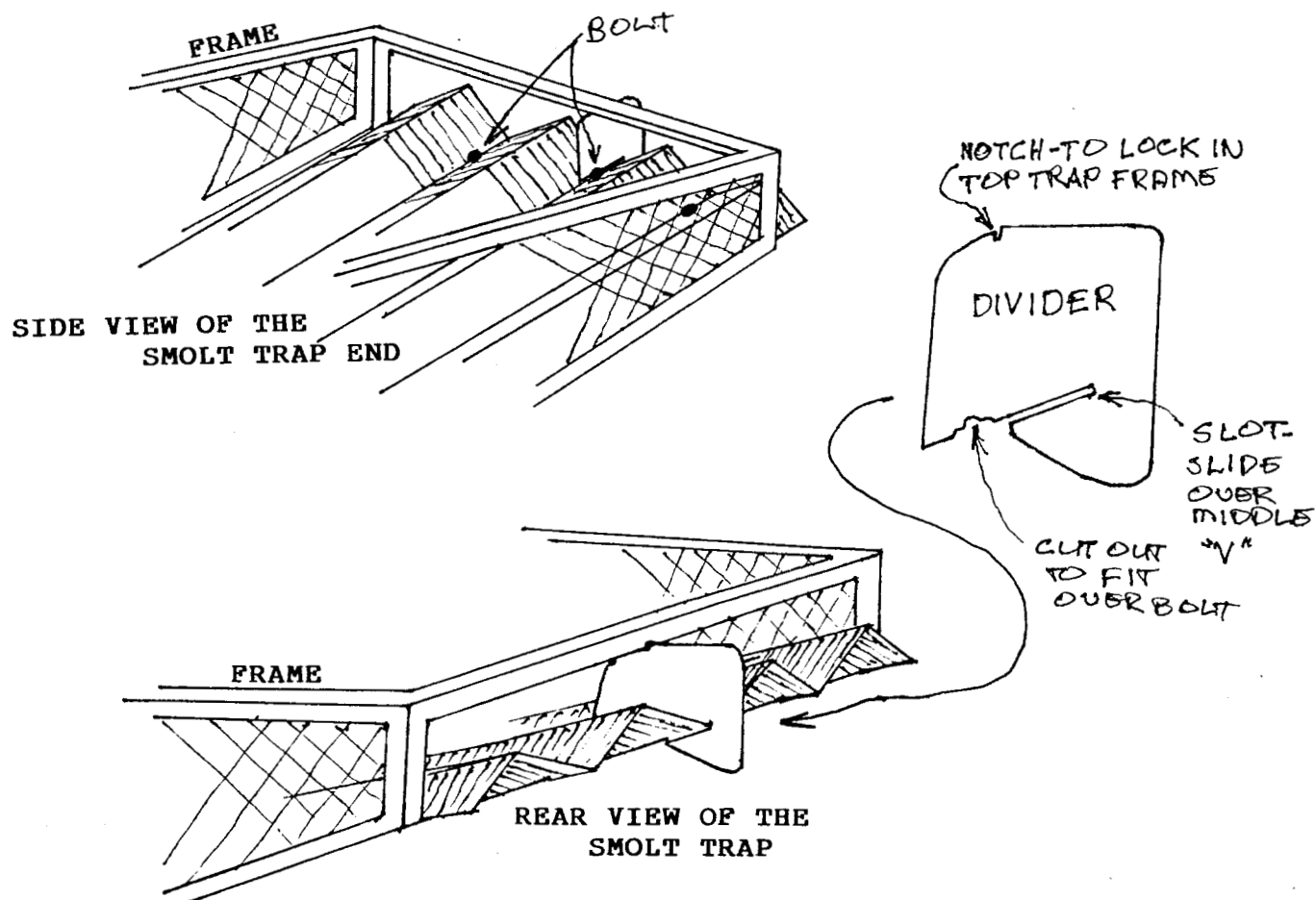


Figure 1. Sketch of the Red Lake smolt trap showing placement of the live-box divider.

FRAZER LAKE
1992 OPERATIONAL PLAN



Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, AK 99615

MAY 1992

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INTRODUCTION

Frazer Lake is located on the Southern end of Kodiak Island and is the second largest lake within the Kodiak Archipelago (Figure 1). Frazer is 14.2 km long, 1.6 km wide, with a surface area of 16.1 km². Prior to 1951 Frazer Lake was void of sockeye salmon (*Oncorhynchus nerka*) owing to a 10 meter barrier falls prohibiting anadromous fish from entering the lake (Russell 1972). Egg, fry and adult transplants (1951-1971) from sockeye systems on Kodiak Island (Karluk and Red Lakes) and the Alaska Peninsula (Becharof Lake) established a sockeye salmon run with adults returning for the first time in 1956 (Russell 1972). From 1956-1961 returning adults were back-packed over the falls, and in 1962 a fishpass constructed to promote access to the lake environment. A second fishpass was installed in 1979 allowing for increased passage capacity during peak migration periods.

Since 1956, enumeration of adults and sampling for age, weight, and length has been conducted at the Frazer fishpass. Spawning surveys have been performed since 1964. Annually, smolt migration timing and magnitude, zooplankton density and community composition, along with limnological characteristics are measured.

Conservative fishery management practices have been very successful at building this run (1970-1985) from 25,000 in 1971 to 645,739 fish in 1985. Blackett (1975) established an escapement goal of 383,000 adults based upon limnological and spawning habitat calculations. Subsequent declines in smolt condition factor, and shifts in zooplankton size and community composition caused Kyle, Koenings, and Barrett (1986) to reduce the target escapement goal to 140,000-200,000 adults. The Frazer sockeye run in 1990 was 1,007,666 fish, comprised of a 753,126 fish harvest (valued at \$5.7 million dollars) and a 254,540 fish escapement. This run has also provided an enhanced food resource for the local Kodiak brown bear population, stimulating increases in bear densities along Frazer Lake and Dog Salmon Creek streams.

In 1986, ADF&G Fisheries Rehabilitation and Enhancement (FRED) Division transferred operation of the Frazer fishpass facility to the Commercial Fisheries Division which now operates the program. FRED Division since 1988 has applied fertilizer (mixture of Nitrogen and

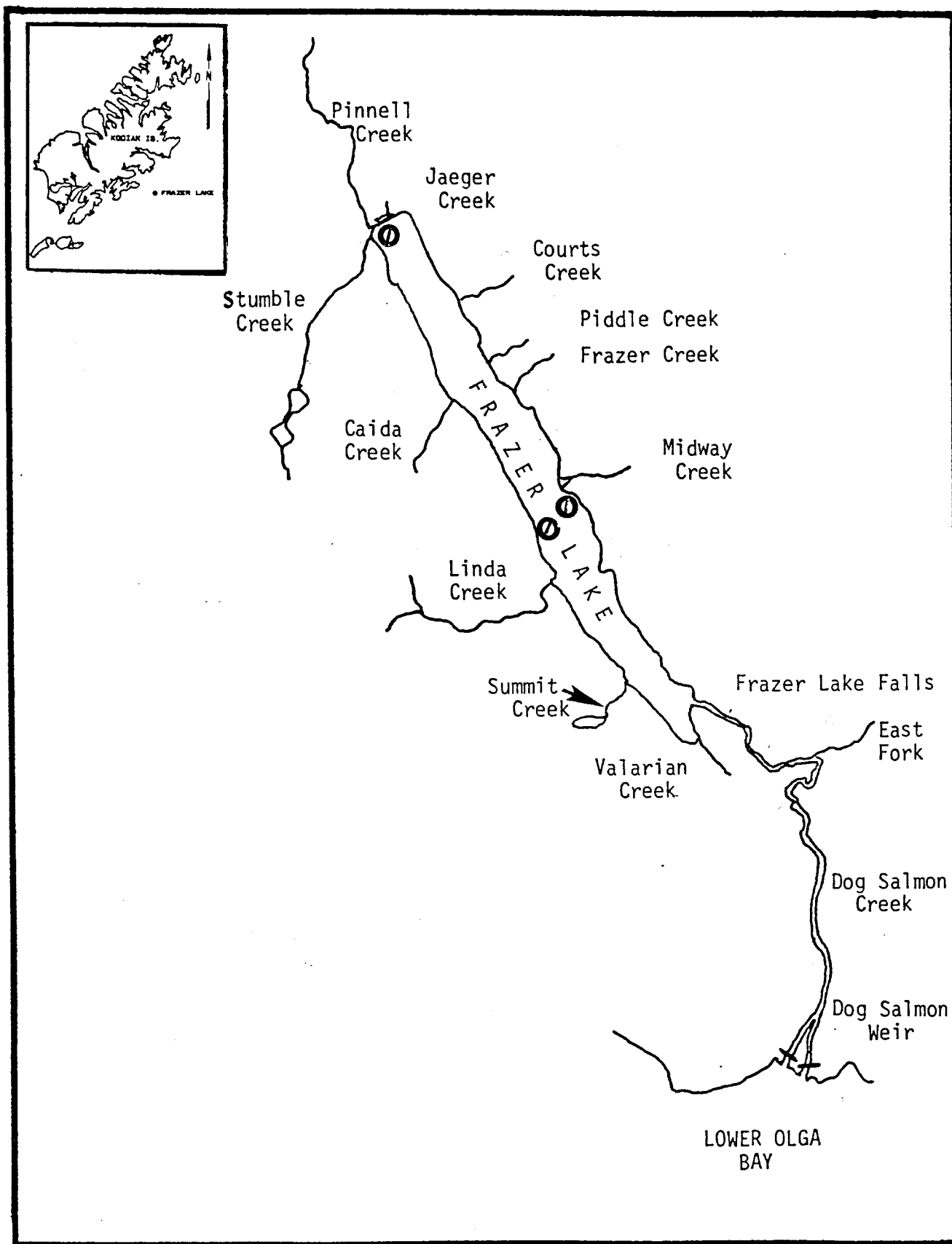


Figure 1. Map depicting Frazer Lake inlet streams and littoral beach seining sites.

Phosphorous) to the lake hoping to stimulate survival of lake rearing sockeye fry. This program was instituted in response to the dramatic declines in smolt size and weight resulting from excessive escapements which occurred in 1982 and 1985.

During 1983 a second weir was installed on Dog Salmon Creek 0.7km upstream from lower Olga Bay to provide more timely sockeye and pink salmon (*Oncorhynchus gorbuscha*) escapement counts relevant to managing the commercial fishery. Weir personnel also enumerate chinook (*O. tshawytscha*), coho (*O. kisutch*), chum (*O. keta*), steelhead and rainbow trout (*O. mykiss*), and dolly varden char (*Salvelinus malma*).

OBJECTIVES

The Commercial Fisheries Division's goal for the Frazer Lake project is optimizing natural sockeye production, and collection of data relevant to generating accurate pre-season forecasts. For 1992 specific tasks are:

1. Determine sockeye smolt abundance, timing, age composition, length and weight at age.
2. Provide unobstructed and timely adult fish passage into the lake environment.
3. Determine escapement timing, magnitude, and spawner distribution.
4. Collect age, sex, and length data from adult sockeye escapements.

SUPERVISION

The project leader is Charlie Swanton with Don Tracy and Mark Larrison being Crew leader and assistant, respectively. Don is responsible for scheduling daily work assignments, assuring collected data adheres to plan standards, and that safety is priority. A brief chronology of assignments is presented (Table 1).

Table 1. Season summary of events.

Date	Event	Frequency
5/13	Open camp	
5/15-8/24	Camp and equipment maintenance as needed	
5/15-6/15	Fishpass maintenance as needed	
5/15-7/15	Sockeye smolt	enumeration 2-4 times daily sample 70/day 6 days/week mark and recapture 1,000 weekly
6/15-8/25	Adult sockeye	enumeration daily sample 240 weekly
5/16-8/15	Fry	seine and sample 25/species weekly three sites on the lake
7/15-8/25	Foot surveys	two streams weekly
8/25	Close camp	

PROCEDURES

Smolt Sampling

The smolt program has two components, abundance estimation and age, length, and weight sampling. Abundance will be derived using catches from two traps (concrete and inclined plane) operated from about 10 May to about 15 July. Each trap will be checked every thirty minutes each night and catch enumerated by species, recorded (Figure 2), and released. Trap catch efficiency will be generated from mark-recapture experiments using Bismark brown-Y dye. The sample size for marked fish is 1000 smolt collected (optimally in a single night) over a maximum of two days. Smolt selected for dying from both traps should be proportional to catch from each trap (e.g. 500 catch from concrete, and 300 from inclined plane, then 312 are dyed from concrete and 112 from inclined plane). The amount of dye will be 1 g per 10 gallons of water; smolt should be emersed in the dye solution for about 45 minutes. Transporting smolt will be via tractor and dyed smolt are to be released evenly spaced across the stream at a site providing suitable cover. The dye process should take place after transportation to the release site. All dyed smolt prior to release are to be held for approximately 30 minutes and closely scrutinized for abnormal behavior, any smolt which show signs of stress will NOT be released. Timing of the process should be late afternoon (3-4 pm). The dyed fish total recorded should reflect only those fish which were actually released (Figure 3). All catch data of marked and unmarked fish will be recorded separately for each trap (Figure 4). Marked fish recovery will take place covering three successive nights. During the initial stages of smolt outmigration monitoring, smolt numbers may be such that the 1000 fish sample size is not attainable. In these instances, a minimum of 150 smolt from both traps combined in a single night will be the benchmark for instituting a dye test, and again the following night. This will provide for a minimum sample size of 300 smolt captured over a two day period, with the recovery period being extended to a forth night. Smolt age, weight, and length sampling will be proportional to catch from each trap with 70 smolt per day sampled for six consecutive days, and a dye test conducted on the seventh day. If total catch for both traps are less than 70 fish, all smolt will be sampled. Data will be recorded on standard AWL forms consecutively numbered corresponding to slides. In order for the optical scanning machine to collect all data recorded the litho code (right hand side on back of AWL form) needs to be transcribed from the front of each form. AWL litho codes should be

DAILY SMOLT CATCH REPORTING FORM

TRAP NUMBER .

PROJECT LOCATION

DATE _____

TIME (MILITARY)	SOCKEYE SMOLT (numbers)			OTHER (numbers)			COMMENTS 2/
	CATCH 1/	EXAMINED FOR MARKS	MARKED RECOVERIES	COHO	DOLLY V.	STICKLEB.	
TOTAL							

1/ Catch number does not include marked recoveries.

2/ To be included in comments: estimate young-of-year fry numbers by species and number of sockeye smolt mortalities.

Figure 3.

SMOLT DYE RELEASE FORM

DATE (actual): _____

CREW NAMES (print) _____

PROJECT LOCATION _____

NUMBER OF FISH COLLECTED: _____
(from live box)

CREW LEADER
(signature) _____

	COLLECTION LIVE BOX	TRANSPORT BUCKET	RECOVERY CONTAINER	DYE TUB	RECOVERY CONTAINER	TRANSPORT BUCKET	STREAM RELEASE
START TIME (military)							
START TEMP (degree celsius)							
END MORTALITY (number of fish)							
OXYGEN SUPPLEMENT O2 or aerator (A)							

DYE SOLUTION (mixture): _____ Dye (grams); _____ Water (gallons)

RELEASE SITE LOCATION (distance upstream of trap site, in miles) _____

TOTAL NUMBER OF DYED FISH RELEASED: _____

COMMENTS:

SOCKEYE SALMON SMOLT SUMMARY FORM

PROJECT LOCATION : _____

[illegible]

2/ Numbers of fish caught does not include marked recoveries.

consecutively ordered. Microscope slides will have scales from five fish aligned in rows and separated so that ageing is possible. Blank slides and AWL forms will be used for each day of sampling.

Escapement Passage

The old fishpass will be operated from approximately 15 June-21 August, with the starting date scheduled to minimize smolt passage through the fishpass. Commencement of fishpass operations will occur the day after sockeye are first counted through Dog Salmon weir. New fishpass operation will proceed only when greater than 30,000 sockeye per day are passed through the old fishpass, therefore preventing unnecessary fish buildup. Diversion weirs above and below the Frazer falls will be inspected daily for holes, and cleaned when required. Specific instructions for fishpass maintenance and operation are provided (Appendix A). The fishpass entrance bulkhead will be suitably modified if the new entrance chute gates prove ineffective; astroturf padding installed on the bulkhead will minimize fish mortality.

Escapement counting frequency will be scheduled to minimize migration delay. Specifically, counts will be made at least four times daily, and during peak escapement with increased frequency. Individual counts by species will be recorded using hand-held tally counters and data recorded (Figure 5). A standard escapement counting and sampling day will extend from Sunday to Sunday (statistical week).

Escapement Sampling

Sockeye escapement age, length, and sex sampling will be conducted weekly (statistical week) over a two day period. Sample size per week is 240 fish (Table 1). If possible collect the sample during a single day, but do not extend beyond two consecutive days even if fewer than 240 samples have been collected. Procedures for collecting and recording ALS data are given (Appendix B).

ALASKA DEPARTMENT OF FISH AND GAME
KODIAK MANAGEMENT AREA
WEEKLY SALMON WEIR CAMP REPORT FOR YEAR: _____

Figure 5.

WEIR CAMP										WEEKLY REPORT									
NAME: _____					PERSONNEL: _____					NO: _____					FOR WEEK ENDING (SATURDAY) _____				
DATE	DAILY TOTAL SALMON ESCAPEMENT					DAILY TOTALS	JACK NO.	REDS %	STEELHEAD		DOLLYS UP	GILLNET MARKED		H ₂ O LEVEL		H ₂ O TEMP.	WEATHER		
	KINGS	REDS	COHO	PINK	CHUMS				DOWN	UP		REDS	OTHER	UP	DN		CEIL.	VIS.	WIND DIR./SPEED
SUN D																			
SUN A																			
MON D																			
MON A																			
TUE D																			
TUE A																			
WED D																			
WED A																			
THU D																			
THU A																			
FRI D																			
FRI A																			
SAT D																			
SAT A																			
TOTAL FOR WK _____																			
ACCUM. THRU WK _____																	COMMENTS		
WEIR MORTS. FOR WK _____																	COMMENTS		
TOT. ACCUM. AWL SAMPL. FOR WK _____																	COMMENTS		
TOT. ACCUM.																			

ADDITIONAL COMMENTS: (BEAR AND PEOPLE PROBLEMS: SMOLT MIGRATION: WEIR PROBLEMS: CABIN REPAIR: NOTE AIRCRAFT TRAFFIC)

Escapement stream and lake surveys

The primary objective of lake and stream surveys are to document distribution and abundance of sockeye within stream and lake shoal areas. Surveys will be conducted weekly from 15 July-21 August with Linda and Midway Creeks being priority. Streams will be surveyed to the upper limits of spawner distribution and recorded (Figure 6). Additionally, spawner limits will be noted on U.S geological survey topographic maps for each stream. Stream mouth counts will be recorded separate from actual stream counts. Observers will survey on foot and enumerate live and dead sockeye using polarized glasses, and tally counters. Before conducting surveys, tally counters will be inspected for proper functioning. An additional survey task will be to conduct surveys of the lake outlet stream between the lake and barrier falls several times prior to seasons end. Some concern has been generated that substantial numbers of sockeye use this area for spawning.

Rearing fry and limnological sampling

Three Lake littoral sites will be sampled using a 16.6 meter fry seine biweekly from 16 May-15 August. Specific sites are identified with metal fence posts and are depicted in Figure 1. Additionally, photographs of these sites are provided within the operational plan logbook. A single seine set will be made at each station between 1000 and 1400 hours, attempting to minimize diurnal influence in catches. Catch will be recorded by species (Figure 7) and 25 fish of each salmon species caught, measured for length (tip of snout to fork of tail), and data recorded.

MAINTENANCE AND BUILDING PROJECTS

Several building projects will be completed on a time available basis during the 1992 field season they are: (1) a sauna/bathhouse located adjacent to the main facilities, adequate lumber should exist on site for this project; (2) the road leading from the lake to the main cabin will be upgraded so that a somewhat even surface for transport of supplies and smolt can be completed

Figure 6.

SOCKEYE SALMON STREAM SURVEY LOG

[illegible]

Figure 7. Seine catch log.

Lake: _____ Time: _____ Remarks: _____
 Date: _____ H2O temp: _____
 Location: _____
 Seine length: _____ Crew: _____

Total Catch

Sockeye _____ Coho _____ Dolly V. _____ Stickle. _____ Rainbow _____ Other _____

Length Sample

	Sockeye	Coho	Dolly V.	Stickleback	Rainbow
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
20					
21					
22					
23					
24					
25					

in a timely manner; (3) measurements of the planks securing the channel iron for securing the weir panels below the falls should be completed so that replacement planning can commence.

APPENDIX A

Fishpass Maintenance and Operation

Initial maintenance of the fishpass will be completed prior to 1 June to insure proper functioning of the facility.

Maintenance consists of:

1. Thorough inspection of the fishpasses for structural damage.
2. Replacement of broken/missing tank covers.
3. Cleaning of debris from fishpass tanks and runs.
4. Attachment of rubber bumpers on ends of fishpass and inside tanks.
5. Regrouting of fishpass where needed.
6. Cleaning entrance tanks, installation of wings and attachment of astroturf mats.
7. Clearing rocks and streambed materials from exit tank, channel, stop-log base of water control weir, and entrance tanks.

Fishpass opening procedures:

1. Wood drain plugs inserted from inside tanks into drain holes. Plugs should fit tightly, so that internal tank water pressure holds plug in place. Install tank caps screwed on from outside.
2. Tank covers positioned and stop-logs removed slowly from exit tank. Bottom stop-log remains in place. Note that if stop-logs are removed rapidly gravel is deposited into tank.
3. Make sure no holes are present where fish could escape uncounted.
4. Install heavy gauge vinyl wire across front of water control weir which prevents fish from washing over falls, attach so that screen is secure on substrate and does not lift off bottom.

The fishpass will be operated so that steeppasses are 2/3-3/4 full of water. This volume is necessary to attract sockeye to the entrance tank and promote optimum fish passage. A water level of 1.88-1.9 feet (54.86-55.47cm) should be maintained on the staff gauge by removing or placing stop logs at the water control diversion (top of falls). At this level the old fishpass will be 3/4-4/5

A 9-inch (22.86cm) wide vertical slot "door" is placed at the entrance tank during most of the annual sockeye run. This door will be checked daily during fish passage to assure it is completely down. It can open when sockeye hit against it, so diligence is necessary. The opening space (22.86cm) is needed to maintain velocity for fish attraction. The door can be opened to 1 foot (30.48cm) at seasons end to further attract fish.

The fishpass will be checked daily for cover tightness and unobstructed water flow. Under no circumstances should obstructive materials be placed in the exit tank or steeppass.

Avoid allowing detergents or chemicals from entering the fishpass water supply. Visitors and all other personnel will not be allowed on the fishpass nor interfere with salmon passage.

Fishpass closing procedures (approximately 25 August):

1. Remove stop-logs from water control weir and stack on bank, replace stop-logs in exit tank.
Visqueen as necessary to stop water flow between logs.

2. Remove all drain caps by unscrewing and lightly tapping them from outside tanks, store caps and plugs in tractor shed. All water should be drained from tanks. All residual materials within tanks should be removed.
3. Remove vertical slot door and store in tractor shed while replacing it with a solid door to prevent unwanted visitors entering.
4. Inspect fishpass and facility for needed repairs and list including inventory, and needed materials in the daily log/annual report. Also include fuel caches and propane so that we know what is left behind.
5. When lower weir is removed, panels will be stored on the lower stream bank. Bolts on the weir should be tightened and replaced if necessary. Catwalk and stringer materials should be inspected and replaced if required. Add lumber needs to materials list.

APPENDIX B
Adult Sampling Procedures

SCALE SAMPLING

Scale cards:

The scale card is a gum-backed sheet numbered 1 through 40. Scales from the sample are placed on the card with no attempt to separate the fish by sex.

Use the card holders provided to prevent the cards from getting wet during sampling . **The cards must be kept dry at all times.** A wet gum card may make the scales unreadable. If the weather is too bad, suspend sampling until dryer conditions prevail. When the card gets wet glue often obscures scale features and scales frequently adhere poorly to the card. In this situation the scales should be remounted on a new card. Cover the completed gum card with wax paper for storage, place the cards between two flat surfaces to prevent distortion.

A new, consecutively numbered, card is used each day, even if the previous card is not completed. **Scale cards numbers must match the corresponding AWL sheet.** Do not repeat the sample number during the season.

Fill out the gum cards as shown in Appendices B.1 and B.2.

Species:

Write out completely (i.e., sockeye, coho).

Locality:

For catch sampling and escapement sampling write down area in which fish were caught followed by "escapement" (i.e. Karluk River escapement).

Stat. Area and Sampling Date:

Transfer the appropriate numbers from the AWL form.

Gear:

Write out completely. (Weir/Trap, Beach Seine)

Collectors:

Record the first and last name of the person(s) sampling on the first AWL and scale card, initials are acceptable on latter cards and AWLS.

Remarks:

Record any pertinent information such as number of scales per fish sampled (1=sockeye,2=coho,4=chinook), factors affecting sampling, bears in the trap, difficulties sexing fish, ect. Transfer this same information to the top margin of the AWL.

Sampling:

1. Take the preferred scale if it is available, if not note that the scale taken is not preferred (error codes on AWL). The "preferred scale" is located on the left side of the fish, two rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin

Species: SOCKEYE Card No: 001
 Locality: AKALURA ESC.
 Stat. Code: 257-30-302
 Sampling Date: Mo 09 Day 16 Year 91
 Gear: BEACH SEINE
 Collector(s): HICKS KAPLAN PEARSON
 Remarks: _____

10	9	8	7	6	5	4	3	2	1
20	19	18	17	16	15	14	13	12	11
30	29	28	27	26	25	24	23	22	21
40	39	38	37	36	35	34	33	32	31

DESCRIPTION: Sockeye/Akalura/ESC.

samples = HICKS, KAPLAN, PEARSON(R)

ADFG ADULT SALMON AGE-LENGTH FORM VERSION 2.1

CARD: 001

SPECIES: 2

DAY: 16

MONTH: 09

YEAR: 91

DISTRICT: 257

SUBDISTRICT: 30

STREAM: 302

LOCATION: Akalura

PERIOD:

PROJECT: 3

GEAR: 2

MESH:

TYPE OF LENGTH MEASUREMENT: 2

NUMBER SCALES/FISH: 1

OF CARDS: 1

#	SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
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96						
97						
98						
99						
100						

DO NOT WRITE IN THIS MARGIN

litho code

229518

DO NOT WRITE IN THIS AREA

NCS DOCUSCAN® M820 17877-10 A4208

SPECIES

- 1 - Chinook (king)
- 2 - Sockeye (red)
- 3 - Coho (silver)
- 4 - Pink (humpy)
- 5 - Chum (dog)

PROJECT

- 1 - Commercial catch
- 2 - Subsistence catch
- 3 - Escapement (tower, weir, sonar site, etc)
- 4 - Escapement - spawning grounds
- 5 - Test fishing
- 6 - Sport catch (marine)
- 7 - Sport catch (freshwater)

GEAR TYPE

- 8 - Trap
- 9 - Purse seine
- 10 - Beach seine
- 11 - Herring purse seine
- 12 - Handpicked
- 13 - Dip net
- 14 - 15 Unassigned
- 16 - Beam trawl
- 17 - Shovel
- 18 - Weir
- 19 - Fishwheel
- 20 - Pots
- 21 - Sport boat and line
- 22 - 99 Unassigned

Species: COHO Card No: 001A
 Locality: KARLUK ESC
 Stat. Code: 255-10-101-
 Sampling Date: Mo 08 Day 29 Year 91
 Gear: WEIR / TRAP
 Collector(s): T. STACK, S. BROWN, J. FOX
 Remarks: 2 SCALES / FISH

card: 001A

10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49

DESCRIPTION: COHO / KARLUK / ESC
2 SCALES / FISH

SAMPLERS:
T. STACK - W
S. BROWN - P
J. FOX - R

ADF&G ADULT SALMON AGE-LENGTH
 FORM VERSION 2.1

CARD: 001A#B

SPECIES: COHO

DAY: 29

MONTH: 08

YEAR: 91

DISTRICT: 255

SUBDISTRICT: 10

STREAM: 101

LOCATION: 35

PERIOD: —

PROJECT: ESC

GEAR: WEIR / TRAP

MESH: —

TYPE OF LENGTH MEASUREMENT: 2

NUMBER SCALES / FISH: 2

OF CARDS: 1

SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
1					
2					
3					
4					
5					
6					
7					
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40					

NCS DUCUSCAN M820-17877-109 A5200

Species: COHO Card No: 001B
 Locality: KARLUK ESC
 Stat. Code: 255-10-101-
 Sampling Date: Mo 08 Day 29 Year 91
 Gear: WEIR / TRAP
 Collector(s): T. STACK, S. BROWN, J. FOX
 Remarks: 2 SCALES / FISH

card: 001B

10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49

Appendix B.2. AWL and scale cards for sampling 2 scales per fish.

to the anterior insertion of the anal fin (Appendix B.3). If the "preferred scale" is missing, select a scale within the preferred area on either the left or right side of the fish. If no scales are present in the "preferred area" on both sides of the fish, sample a scale as close to the preferred area as possible and darken the 8 under age error code on the AWL form. **Do not take a scale from the lateral line they are creased and worthless for digitizing!**

2. Clean the scale by wetting it and rubbing it between your fingers. Make sure no dirt, slime or skin (no silver color) remain on the scale.
3. Mount the scale on the gum card with the ridged (rough) side up. The ridged (rough) side of the scale is the same side that is exposed on the salmon.
4. Mount scale with the annular ring arches up (Appendix B.3).
5. One scale will be taken from sockeye and two scales from coho (Appendix B.1, B.2). When taking multiple scales per fish sample the "preferred scale" and second scale one inch to the left of the "preferred scale," and two rows above the lateral line. Mount the 2 scales from fish #1 over 1 and 11 on the gum card as shown in Appendix B.2. Continuing, mount the 2 scales from fish #2 over 2 and 12, etc. If sampling 3 scales, mount the scales over #1, #11, #21, etc.
6. Scales should be neat, clean, and orderly.
7. **CHECK EACH SCALE FOR CORRECT MOUNTING BEFORE SENDING IT TO TOWN.** A light touch with your fingernail and a visual inspection of the orientation of the arches will reveal any problems. Remount the scales if necessary.

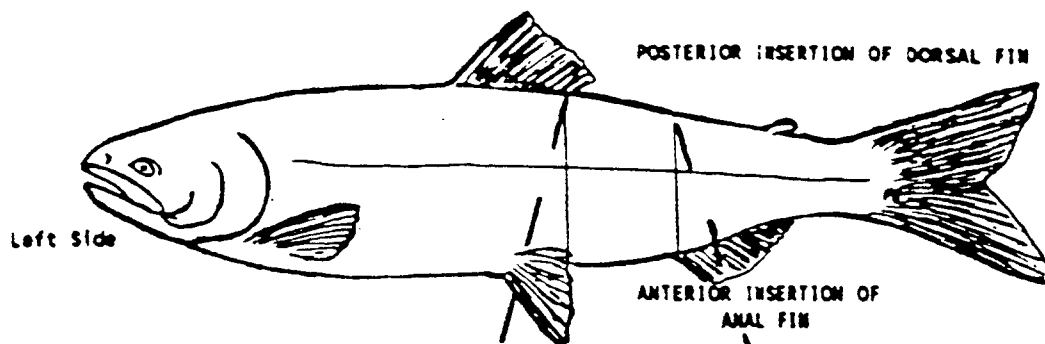
SCALE SAMPLING CHECKLIST		
Clipboard	Pencils (No.2)	Measuring board or caliper
Gum Cards	Forceps	Sampling Manual
AWL's	Wax paper inserts	Plastic scale card holders
Gloves		

AGE-WEIGHT-LENGTH (AWL) FORMS

Data must be recorded on the mark-sense forms neatly and accurately. Keep the mark-sense forms flat, dry, and clean. Fish gurry and water curling will cause data to be misinterpreted by the optical scanning machine. The forms should be neat and legible enough to have a stranger be able to make sense out of them.

When sampling a weired system you may use "rite-in-rain" books to record the data. Keep the mark-sense forms in camp where they will be clean, dry, and flat. After sampling is done for

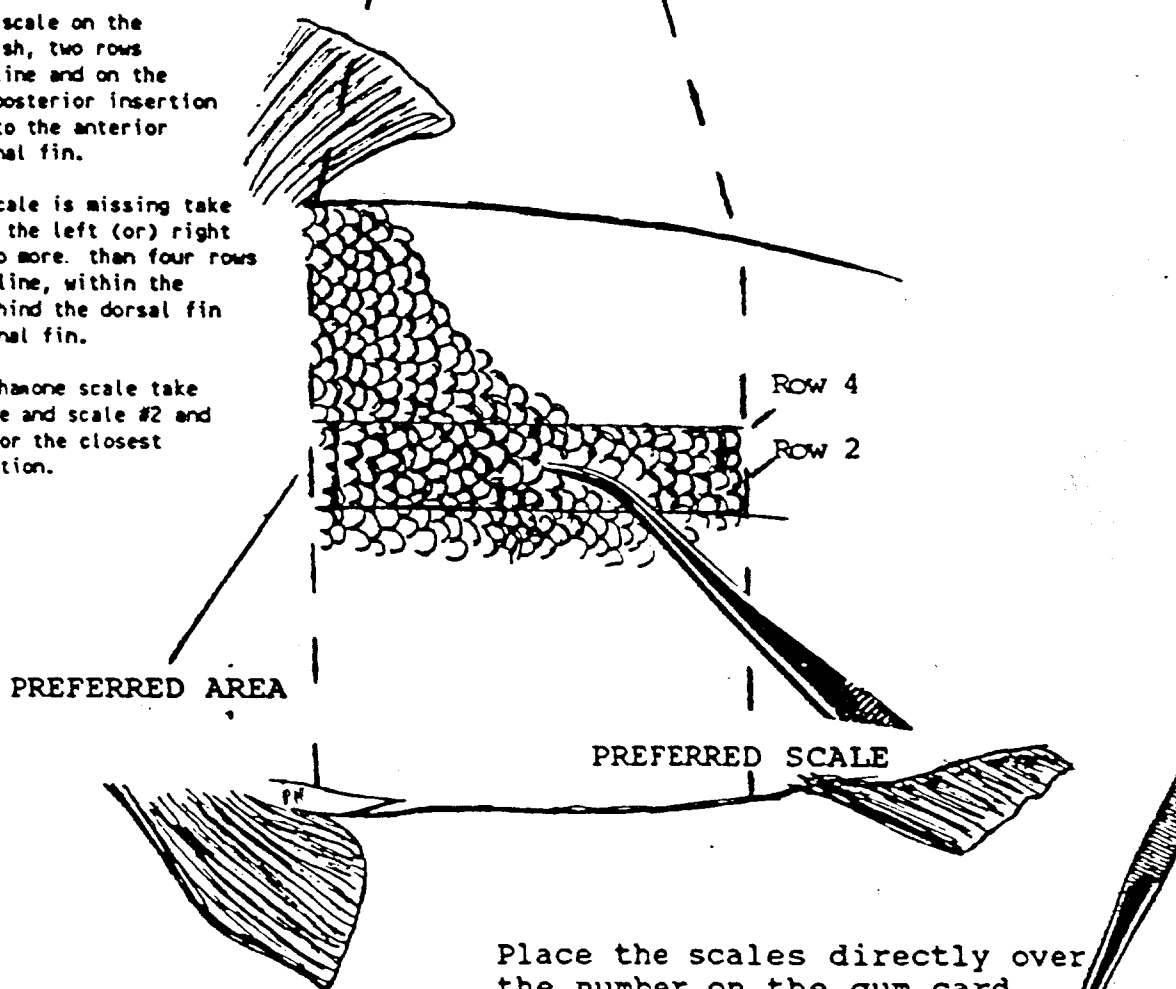
Appendix B.3. Sampling procedure for the preferred scale.



Take the preferred scale on the left side of the fish, two rows above the lateral line and on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin.

If the preferred scale is missing take a scale again from the left (or) right side of the fish no more than four rows above the lateral line, within the preferred area, behind the dorsal fin and ahead of the anal fin.

If sampling more than one scale take the preferred scale and scale #2 and scale #3 as shown or the closest scale to that location.



Note: Mount scales with the anterior portion (arches) of the scale pointed toward the top of the card.



Place the scales directly over
the number on the gum card. //

10	9	8	7	6	5	4	3	2	1
20	19	18	17	16	15	14	13	12	11
30	29	28	27	26	25	24	23	22	21
40	39	38	37	36	35	34	33	32	31

the day transfer the data to the mark-sense forms. **It is the responsibility of the data collector to transcribe the data before sending the forms to the office.**

A completed mark-sense AWL form and accompanying gum card for sampling sockeye is shown in Appendix B.1. A completed AWL form and accompanying gum cards for sampling coho salmon are shown in Appendix B.2.

Complete each section of the left side of the mark-sense form using a soft No. 2 pencil and darken the corresponding blocks as shown in the figures. Make every effort to darken the entire block, do not allow your marks to overlap the adjacent rows. Partially filled blocks are often missed by the optical scanner, overlapping marks on adjacent rows creates multiple numbers and error codes for the sampled fish. This causes a lot of problems for Patty Roche and Leslie Scott when they are processing the sample. Do not mark on the left hand margin of the form. Label only one form at a time to avoid "the carbon paper effect" and resulting stray marks. Do not attach any thing to the AWL with paper clips, this may cause the OpSCAN reader to miss-feed the form.

Description:

Species/Area/Escapement i.e. Sockeye/Karluk weir/Escapement

Samplers: W-(Wrestler) Name

P-(Scale plucker) Name

R-(Recorder) Name

List any factors relating to sampling, number of scales collected, bear in the trap, difficulties sexing fish, ect.

Card:

The AWL forms and corresponding gum card(s) are numbered sequentially by date throughout the season starting with 001. A separate numbering sequence will be used for each species and geographic location. Consult your crew leader for the current card number. The number of cards varies by species; sockeye samples use one card per AWL form (Appendix B.1), coho samples require two cards per AWL (Appendix B.2).

Species:

Refer to the reverse side of the AWL form for the correct number.

Day, Month, Year:

Use the date when the fish are caught.

District, subdistrict, stream number:

List only one district, subdistrict and stream number. I.e. for the Karluk weir: 255 (district), 10 (subdistrict), 101 (stream number). Consult the Kodiak Area Statistical Area Chart for the appropriate district, subdistrict, and stream numbers. If you do not have the chart ask the Kodiak office for the correct numbers, do not leave these sectors blank.

Location:

List the appropriate code as shown on Appendix B.4. For example Karluk weir is (035).

Appendix B.4. Assigned port and weir location codes.

Port and Location Codes

030 - Lazy Bay
031 - Port of Kodiak
032 - Pauls Lake
033 - Thorshiem
034 - Afognak River
035 - Karluk River
036 - Red River
037 - Upper Station
038 - Frazer Lake
039 - Dog Salmon
040 - Akalura River
041 - Uganik River
042 - Malina Creek
150 - King Cove
151 - Port Moller
052 - Dutch Harbor
053 - Akutan
054 - Sand Point
055 - Bear River, ADF&G Camp
056 - Nelson River, ADF&G Camp
057 - Canoe Bay

Project:

Refer to the reverse side of the AWL form for the correct code for escapement sampling (3).

Gear:

Refer to the reverse side of the AWL form for the correct code (19).

Mesh:

Leave blank unless specifically instructed by supervisor to do otherwise.

Type of length Measurement:

Use (2) mid-eye to fork-of-tail, unless specifically instructed to do otherwise (Appendix B.5).

of cards:

Mark 1 when sampling sockeye and coho salmon (Appendix B.1 and B.2). When sampling coho salmon write the card numbers (i.e. 001A, 001B,) as shown in Appendix B.2.

Sex:

Darken M or F in the sex columns. If any difficulty was encountered in this procedure, write "trouble sexing fish" on the top margin of the AWL and ask your supervisor for help as soon as possible before sexing additional fish.

Length:

Measure all length in millimeters from the middle of the eye to the fork of the tail, refer to Appendix B.5. Record length by blackening the appropriate column blocks on the AWL form. Column 3 on the AWL form is used for fish over 999 millimeters long. Measure all fish to the nearest mm. If you use calipers check them daily, before use, to ensure the accuracy of the measurements. **LENGTHS MUST REFLECT CORRESPONDING SCALES.**

Additional data columns:

Additional data may be recorded on the back of the AWL for individual project use. If you use them and wish that data to be read by the opscan reader, you will need to transfer the litho code from the front of the form to the back. Weights, if taken, should be noted in the right hand margin of the awl when during sampling and be transferred to the back of the awl sheet. Adipose clipped fish should have the head tag number recorded on the corresponding row in the first five columns on the reverse side of the AWL. Tagged fish that are sampled should also be recorded in this manner. Note all tagged fish observed in your log book.

After editing a form, place your initials next to card #, but not in left margin.

As soon as possible after completion send the samples and mark-sense forms to the office in Kodiak. During scheduled radio calls before sending the data in, the crew leader will notify the area biologist: 1) that the data is being mailed (use a moisture-proof container); 2) what data is being sent; 3) when delivery is expected in Kodiak; and 4) who is transporting the data. It is important that these steps are followed to ensure delivery.

REMINDERS

- 1) AWLs should be carefully edited. Re-check header information on AWLs; make sure all available information is filled in. Take extra care to use the correct statistical week for the sampling or catch date. Page numbers should not be repeated; a frequent error is to begin a week's sample with the last page number used the week before. Take time to ensure that the boxes are being blackened correctly. Keep marks within each rectangle and completely fill them. After AWLs are edited, place editor's initial next to page number, but not in left margin.

Before sending data forms in, look down the form from two angles to pick up any glaring mistakes.

- 2) Mount the scales correctly, with anterior end (arches up) toward top of scale card with the ridged (rough) side out.
- 3) Make sure the error codes are correct. Error code 7 is wrong species, error code 8 is non-preferred scale. **Error code 6 is for the use of the scale reader**, it refers to the reabsorption of the scale.
- 4) Transfer important comments from scale cards to AWLs. Important remarks can be lost; after pressing scales, the cards are seldom referred to again. Write comments in the top margin (not on the left side). If there is not room on the AWL to completely explain the remarks, use a separate piece of paper.
- 5) Never put data from different dates on one AWL or one scale card. Even if only one scale is collected that day, begin a new card and AWL for the next day.
- 6) If weights are taken be sure to transfer the weights and litho codes to the appropriate columns on the reverse of the AWL before submitting it to the office.
- 7) If possible Keep the litho code in order. The data processing program uses the "litho code" to track the data files. (It is located in the lower left margin of the AWL.) Keep them in order before numbering the pages.
- 8) Recopy all wrinkled or splotched AWLs before sending them in. The optical scanning computer will misread, reject, or destroy damaged sheets.

The responsibility for accuracy lies first with the primary data collector(s). Sloppy or incomplete data will be returned to individual collectors. Compliance with the sampling procedures and schedule will be noted in each samplers evaluation.

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